FOUNDRY TRADE JOURNAL

Established 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 88 Thursday, March 30, 1950 No. 1752

49, Wellington Street, London, W.C.2.

Grams: "Zacatecas, Rand, London"

'Phone: Temple Bar 3951 (Private Branch Exchange)

PUBLISHED WEEKLY: 26s. per annum (Home and Overseas)

Foundry Foremen's Conference

The Conference organised—and very well organised—by the Institute of British Foundrymen last week-end at Ashorne Hill afforded ample opportunity for receiving an appreciation of the types of men charged with carrying out the policy and manufacturing programme of a large section of the foundry industry. These men are serious-minded individuals, both the elderly and the younger ones—for some are still young and have gained promotion quite early in life. They are conscious of their high responsibilities and desire nothing more than the establishment of clear policy to pursue and then complete freedom to act. They resent interference, but welcome assistance so long as it does not undermine their authority. Naturally, they are interested in human relations, but in the shops they rely on their innate aptitude and experience for the handling of difficult situations rather than on the precepts of the text-books. They express their thoughts with reasonable clarity, but there is still room for improvement and repeated attendance at such functions as this Conference or at local meetings of the Institute would be of real help.

The subjects discussed at this Conference were well chosen. The film shown by Mr. Haynes and Mr. Van der Ben, as is invariably the case when the audience consists of foundrymen, created not exactly a good discussion but forthright argument, producing information from all phases of practical technology. Sir Robert Hyde is amongst the best speakers on human relationships. He contrives in an admirable manner to spice wisdom with anecdote. He relies but little upon Latin logic, but he usually indicates, rather than postulates, solutions to the problems facing the foreman. By this means, he leaves with his audience a picture of many types, capable of comparison with those with whom one comes into daily contact. The complications of industrial life were well expounded by Mr. L. Buckley and Mr. A. Makins in their Paper on "Incentives." They showed very clearly the not inconsiderable amount of staff work to be undertaken before a system of payment can be evolved which will give reasonable satisfaction to the employees. Experience in this case showed that more satisfaction could be given when the group payment was broken down to embrace the smallest number of men. Mr. F. C. Lawrence can certainly "juggle" with figures and the lesson of his talk was that there are two sorts of overheads—fixed and variable. Unless these be used separately and with discretion, all kinds of ridiculous conclusions can be drawn. There was a statement in this Paper that a careful test—in one case—showed that cupola losses were of the order of two per cent. This percentage, to our mind, is so far removed from the normally accepted figure that it should be confirmed before being generally accepted. However, there is other evidence available to support Mr. Lawrence's figure of 2 per cent. The balance of the programme was made up of truly practical Papers on "Production Control," by Mr. A. J. Smith, and "Plant Maintenance," by Mr. J. I. Blackbourn.

Of equal importance to the lectures was the general conversation, and amongst other things we learnt was that the foremen of this country would appreciate the giving of information as to districts when concerns are advertising their staff vacancies. Like we do, the foremen resent the monopolisation of fear of unemployment by the worker, as this mental ill affects practically everybody. The members of the Conference were grateful to the staff of the Institute for the work they had done in arranging the meeting; to Mr. Noel Newman for his opening address and to the chairmen of the various sessions.

Contents

	Page
Foundry Foremen's Conference	333
Brass and Bronze Founders' Productivity Team	334
Dinners—I.B.F. London Branch—"Men Only." Alar, Limited	334
Forthcoming Events	334
Films on Foundry Gating Practice	334
Modern Australian Grey-iron Foundry	335
Work in a Jobbing Foundry	341
Canadian Railways Seek U.K. Goods	348
Nickel Company's Earnings	348
Budget Suggestions	348
Courses on Industrial Welfare	348
Fuel Efficiency in the Iron and Steel Industry	349
Heating Appliance Efficiency	350
College Principal Honoured	350
Iron and Steel Institute	351
Personal	352
Obituary	352
British Standards' Institution	353
Parliamentary	353
Movement of Wholesale Prices	353
Imports and Exports of Iron and Steel	354
Pig-iron and Steel Production in Great Britain	356
Raw Material Markets	358

Brass and Bronze Founders Productivity Team

The National Brassfoundry Association, in association with the Association of Bronze and Brass Founders, has organised a productivity team to visit works in the United States. The team will be under the leadership of Mr. Frank Hudson, of the Mond Nickel Company, Limited, and the deputy leader will be Mr. C. H. Wilson, of Evered & Company, Limited, Smethwick. The joint secretaries will be Mr. H. Atkinson, of Woodhouse & Company, Limited, Doncaster, and Mr. A. N. Wormleighton, of Phosphor Bronze Company, Limited, Birmingham. The team sails in the Queen Elizabeth on April 21 and leaves New York on June 6.

The team is made up of the following:—Frank Hudson (leader), foundry research development department, Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1; C. H. Wilson (deputy leader), director, Evered & Company, Limited, Surrey Works, Smethwick; H. Atkinson (joint secretary), secretary, Woodhouse & Company, Limited, Doncaster; A. N. Wormleighton (joint secretary), director and cost accountant, Phosphor Bronze Company, Limited, Bradford Street, Birmingham, 5; L. W. Gummer, works director, Gummers, Limited, Rotherham; J. P. Jewsbury, general manager, planning works, Pearson, Page, Jewsbury Company, Limited, Westwood Road, Birmingham, 6; W. F. Underhill, works manager and general manager, Samuel Booth & Sons, Limited, Cheapside, Birmingham; E. C. Mantle, research investigator, British Non-Ferrous Metals Research Association, London, N.W.1; D. H. Potts, foundry engineer, Westinghouse Brake & Signal Company, Chippenham; F. E. Rattlidge, pattern and tool maker, Evered & Company, Limited, Surrey Works, Smethwick; C. A. Timms, foundry manager and metallurgist, Billington & Newton, Limited, Longport; E. M. Anderson, moulder, Phosphor Bronze Company, Limited, Bradford Street, Birmingham, 5; G. B. Booth, machine-shop charge-hand, Harrison (Birmingham), Limited, Bradford Street, Birmingham, 12; R. T. Bunch, tool-room machinist, E. P. Jenks, Limited, Monmore Green, Wolverhampton; J. J. Keight, in charge of production mill, Whitehouse Bros., Brueton Street, Birmingham; N. Maxwell, moulder, Paisley Brass Works, Hamilton Street, Paisley.

Dinners

I.B.F. London Branch—"Men Only"

Over one hundred foregathered on Friday last at Londonderry House, Park Lane, London, W.1, for the annual "men only" dinner of the London branch of the Institute of British Foundrymen. The evening, which was of the less formal type, was an unqualified success. The occasion provided the branch president, Mr. F. Arnold Wilson, with an opportunity to express the need for the steady in-flow to the branch of the younger people of the industry in order to make good the normal wastage. A cabaret performance was included in the programme.

Alar, Limited

Mr. W. H. Lawrence presided over a ladies' evening dinner organised by Alar, Limited, at the Trocadero, on March 22. Amongst those present were:—Dr. J. Jakobi, Mr. T. C. James, Mr. O. Metzger, Mr. R. T. Priestman, Mr. F. H. Smith, Mr. H. E. Thatcher, Dr. A. G. Quarrell, Mr. V. Brenner, Mr. G. A. Woodruff, Mr. J. Cartland, Mr. E. J. Groom, Mr. V. C. Faulkner, and Mr. R. G. Beresford, most of whom were accompanied by their ladies.

Forthcoming Events

APRIL 3.

Institute of British Foundrymen.

Sheffield Branch:—Three Films, shown by courtesy of the British Steel Founders' Association, at the University, St. George's Square, Sheffield, at 7.30 p.m. (See details below.)

APRIL 4.

Institute of Industrial Supervisors.

Dudley and District Section:—Film, "Wheels Behind the Wheels," at the Dudley and Staffordshire Technical College, Dudley, at 7.30 p.m.

APRIL 5.

Institute of British Foundrymen.

London Branch:—Three Films, shown by courtesy of the British Steel Founders' Association, at the Waldorf Hotel, Aldwych, London, W.C.2, at 7.30 p.m. (See details below.)

Birmingham Students' Section:—Annual General Meeting, followed by a "Brains Trust," at the Central Technical College, Birmingham, at 7.15 p.m.

Institution of Production Engineers.

Wolverhampton Section:—"Industrial Finishes," by A. W. Wallbank, B.Sc., F.R.I.C., at the West Midland Gas Board Demonstration Room, Clarence Street, Wolverhampton, at 7 p.m.

Nottingham Section:—"Costing for Small Engineering Firms," by J. H. Smith, F.S.A.A., F.C.I.S., at the Victoria Station Hotel, Milton Street, Nottingham, at 7 p.m.

Halifax Graduate Section:—"The Production of All-metal Bus Bodies," by G. L. Hart, A.M.I.Mech.E., at the Huddersfield Technical College, at 7 p.m.

APRIL 6.

British Institution of Radio Engineers.

Scottish Section:—Joint meeting with the Institute of Physics. "Electrical Measurements," by F. M. Bruce, M.Sc., Ph.D., at the Institution of Engineers and Shipbuilders, Glasgow, at 6.45 p.m.

Institution of Industrial Supervisors.

Leeds Section:—Films: "Steel," "Industrial Handling," and "Accidents will Happen," at the Great Northern Hotel, Leeds, at 7.30 p.m.

Films on Foundry Gating Practice

The recently formed Research and Development Division of the British Steel Founders' Association has obtained a number of motion films on short loan from the U.S. Naval Research Laboratory, Washington, covering a comprehensive series of practical investigations in this field. These films, which are in colour and have sound accompaniment, have already had extensive circulation in the U.S.A. and in other countries and are now being shown under the auspices of the B.S.F.A. in Glasgow, Sheffield, Newcastle and London. The films have also been made available by the Division to the National Foundry College in Wolverhampton and to Sheffield University. The U.S.N.R.L. films on gating practice are having their final demonstrations, before being returned to America, at the University, St. George's Square, Sheffield, on Monday, April 3, and in London at the Waldorf Hotel, on Wednesday, April 5. Each demonstration is to commence at 7.30 p.m., and invitations have been extended to all interested foundrymen, ferrous and non-ferrous, through the Institute of British Foundrymen, with whom in these instances a joint meeting has been arranged by the Research and Development Division of the B.S.F.A. The titles of the films to be shown are, "Gating Systems for Metal Casting," "Finger Gating," and "Steps Gating."

The Index to the FOUNDRY TRADE JOURNAL, Volume 87, July to December, 1949, is now available free of charge on writing to the JOURNAL Publishing Office at 49, Wellington Street, London, W.C.2.

Modern Australian Grey-iron Foundry*

By V. A. Saveneh

Whilst mechanisation is fairly commonplace in ironfoundries in Europe and America, little of mass-production technique has hitherto been introduced along with foundry mechanisation in Australia. This Paper describes the layout and equipment of an automobile grey-iron foundry with emphasis on the methods for metal melting, moulding, fettling, core-making, ventilation services and good housekeeping. The Author is a consulting industrial design engineer.

THE foundry which is to be described in this Paper was part of General Motors Holden expansion programme to provide grey-iron castings in the production of their Australian car. Expenditure on the erection and equipment was upwards of £A340,000 and, having a floor area of 51,000 sq. ft., the plant is totally unlike the old conception of what a foundry should be. Into it were built the latest overseas ideas, and labour-saving devices, plus clean, well-lit, air-conditioned and dust-free working conditions. Considering the layout, equipment, and the variety of castings to be produced, it is claimed to be superior in many respects to overseas foundries.

The title of this Paper claims to cover layout and description. As interest in foundry mechanisation is growing in Australia, description of plant and equipment would be of greater value than a lengthy history on all the difficulties and requirements of preliminary planning and layout. Therefore, planning will be briefly outlined, whilst the remainder of the Paper will be on plant and equipment.

The allocated area was 84,000 sq. ft., consisting of 42 bays 40 ft. by 50 ft. An estimated area of the foundry was 48,000 sq. ft.; therefore, a most suitable position had to be found on the grid. Expansion of the building would be most convenient on the south side, raw material storage and supply on the west end, and the finished product despatched *via* the east end. Having formulated a flow plan, the next step was to lay out the foundry into proportionate departmental burden areas. Actually this area layout was done at the same time as the grid and equipment layouts. There were many layouts made with every type, shape and position of building on the grid.

The two most important aspects to be kept in mind in planning a layout are to ensure as nearly as possible a direct line of production from the receiving of raw materials to the delivery of the finished product with as few handling points as possible, and to make the whole arrangement flexible so that expansion can occur in both building and plant without change in the general flow and production procedure. Comparing the Melbourne foundry with overseas foundries of similar type, the requirements were very closely parallel. The areas of the foundry are as follow:—

	Sq. ft.
Core shop and sand storage	12,710
Metal melting and pouring (including transformer, ladle and furnace repair) ...	3,150
Metal break-up and internal storage ...	6,000
Moulding and sand preparation	8,300
Fettling	8,000
Main aisles	3,460
Supply, stores and despatch	2,875
Maintenance, patterns, non-ferrous and inspection	3,100
General offices and laboratories	2,805
Compressor room	600
	51,000

Amenities (on mezzanine floors):—

	Sq. ft.
Foremen's cloakrooms	500
Females cloakrooms	700
Males' cloakrooms	2,400

Having actual areas to work on, the procedure would be to look up manufacturers' dimension sheets and catalogues, make guesses as to over-all dimensions of equipment that had to be designed, and then make scale templates from cross-sectioned coloured cardboard. After fixing a $\frac{1}{4}$ in. to the foot plan of the building grid on a board, the next step was to arrange the equipment in the respective areas; always keeping in mind that excessive storage and handling points are places of economic loss and that a direct flow from receipt to despatch not only means a more or less straight-line process in the mechanical sense, but also in the time sense. Furthermore, such points as expansion, space everywhere for access, handling facilities, services, building construction, light, ventilation, nuisances, operation of equipment, product requirements, timing equipment standardisation and operational comfort had to be remembered.

Future expansion was kept particularly in mind. Thus another moulding line could be placed beside the existing one, with the pouring zone remaining around the furnaces, the sand-handling system remaining centralised. Another electric furnace could be installed beside the transformer room. Fettling (non-ferrous) could be moved further south, whilst the core room could expand by moving the stores, maintenance area and pattern repair departments.

After making elevation drawings of equipment, the engineers were able to give the architect not only plan requirements, but also the height of building, position and sizes of penthouses, and the loadings and positions of equipment that might be fixed to roof trusses and columns. The next step, proceeding after layout, was the designing stage of equipment, services, loading and positioning of pits and foundations. In the case of the ground at the site, an upper sand layer is resting on a bedding of silt 16 ft. below floor level. Also, water rises with the river tides to within three feet of floor level. Therefore, from past surveys, the architect works on a standard soil reaction of one ton per square foot at floor level and about quarter-ton below floor level in the design of the building foundations. It can be seen that difficulties appeared in the design of deep pits up to 15 ft., and in the amount of heavy machines resting on pit floors and the foundations for heavy jolting or moulding machines. At 15 ft., there would be a great water pressure at high tide, and so the pit walls were constructed with a reinforced-concrete outer wall 8 in. thick, a water-proofing layer $\frac{1}{4}$ in. thick, then an inner concrete wall 6 in. thick. The longest pit was 200 ft. long, 11 ft. wide and 7 ft. deep.

*Extracted from a Paper read before the Institute of Australian Foundrymen. The foundry was illustrated and very briefly described in our issue of April 21, 1949. Some of the illustrations have been reproduced here to amplify Mr. Saveneh's account.

Modern Australian Grey-iron Foundry

There was also a deviation from the standard design of the company's buildings (which are all of the saw-tooth-roof type) to a rigid-roof type. The standard roof loading on the bottom chord of trusses was one ton at any panel point. This type of building gave excellent natural lighting and also the necessary head room for equipment in the centre of the bays without increasing the height of the building.

Equipment Description and Location

It is not proposed to convey by written word a full description of all items of equipment, but the following is a brief *résumé* of the major items of the installation. Beginning with the raw-material section handling pig, scrap iron, coke, limestone and sand, the main item is the crane. It is a 47-ft. span 5-ton overhead electric travelling crane with cabin control; capacity is 100 ft. per min. cross traverse, 40 ft. per min. hoisting speed, and 275 ft. per min. down-shop travel. For various lifting requirements there is a standard crane hook, a 1¼ cub. yd. grab bucket and a 55-in. electro-magnet pick-up capable of lifting 3,000 lb. of iron.

Metal Melting

Pig or scrap iron are broken up by a 3,000-lb. iron ball released from the magnet; then the broken iron is picked up by the magnet and taken to the cupola-charging area. Here it is dropped into a drop-bottom weigh hopper and weighed, whilst from an adjacent twin-chamber storage hopper coke is released from one chamber and limestone from the other and discharged also into the weight hopper. The weights are recorded on 2,000-lb. weighing scales, having a dial graduated in 2-lb. divisions, and complete with automatic print-weigh mechanism. The 1,000-lb. charge of coke, iron and limestone is then dropped into a drop-bottom charging bucket directly underneath. A winch on the cupola charger hauls the bucket to the cupola opening and the charge is released into the well.

Production requirements for metal were 30 tons per day and a cupola was chosen with a 63-in. inside dia. shell brick lined to a 45-in. dia. by 20-ft. shaft. An extra cupola was installed to provide stand-by capacity in the case of a breakdown and enable maintenance to be carried out without affecting production. The charger can serve either cupola by swinging the frame from one cupola to the other.

Air is supplied to the cupola from a 4,500 cub. ft. per min. 30-oz. pressure blower. Constant air-weight control is maintained with an electrical control for operating the blast-gate mechanism on the inlet side of the blower. Either cupola can be cut off by shutting a sliding gate valve on the blower delivery duct. The control panel has an ammeter calibrated in lb. of air per min. and amperes. Molten metal is tapped from the cupola into a 750-lb. ladle and transferred along a monorail to the electric furnace for duplexing. After superheating in the furnace, the metal is much superior in quality to that obtained direct from the cupola.

The electric furnace is a 1,500-k.v.a. 3¼-ton nominal (9,000 lb. max.), 3-phase, 50-cycle arc furnace with a basic (magnesite) hearth. Cooling water for the furnace and transformer is supplied from a spray cooler mounted on the roof of the transformer room. The required 1,600 galls. per hr. is pumped from the cooler to the furnace and transformer, and drained to a sump tank, from which it is pumped back to the cooler. Mains water is only used for additions in the cooler and in the case of a breakdown in cooler or pumps.

After refining, the metal is poured into 600-lb. barrel ladles and taken along the monorail to the pouring station on the mould conveyor. A continuous monorail from the furnaces to the pouring station allows a number of ladles to be operated between the furnaces and the pouring area, so permitting continuous pouring without hold-ups. This area is also large enough to provide capacity for miscellaneous floor casting, operations, experimental castings and pig moulds for overmetal.

Moulding

Coming to the moulding section, the raw material is sand and its starting point is in the 150-ton storage bin. This bin is totally enclosed with a division in the centre and a diverting flap gate. Each section has two discharge gates and two batch hoppers which serve as measuring media. Therefore, the sand from either of the 75-ton divisions is discharged from the bins into the batch

FIG. 1.—SMALL MILWAUKEE JOLT-SQUEEZE-STRIP MOULDING MACHINE (MADE IN AUSTRALIA UNDER LICENCE).

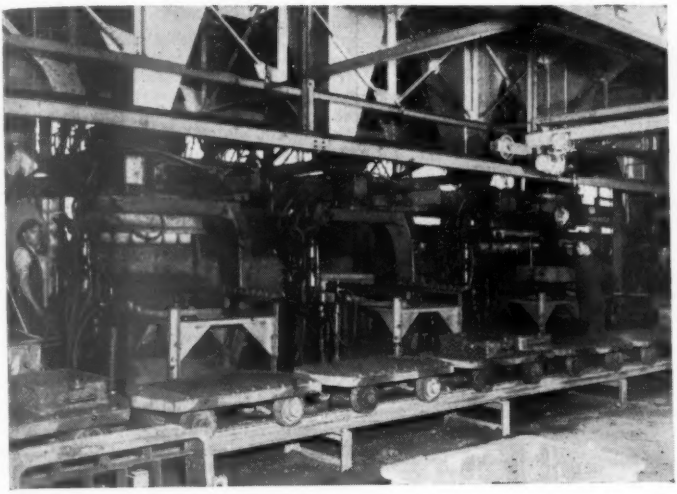


FIG. 2.—LARGER-MODEL MILWAUKEE MOULDING MACHINES, SHOWING, ALSO, ARRANGEMENTS FOR MOULD DELIVERY TO THE PALLET CONVEYOR.

hoppers and from the batch hoppers into either of the two 8-ft. intensive mixers. The sand is mixed with additions put in. Each mixer has a dust and cooling exhaust hood.

After mulling or mixing, sand is discharged through two discharge doors in each mill on to a 24-in. wide by 27-ft. centre belt feeder. The sand is then spilled into the boot of a bucket elevator running at 250 ft. per min., with buckets 52 per cent. full, discharging from the head through an aerator, then on to a belt conveyor 24 in. wide by 164-ft. centre, running at a speed of 150 ft. per min. This conveyor is situated high in the roof trusses and directly over the hoppers feeding the moulding machines. There are ten moulding machines and ploughs to distribute the sand to the hoppers. A platform runs the full length of the conveyor and an attendant keeps an eye on the capacity of the hoppers and operates the necessary ploughs. Sand that is not required for the hoppers spills over the head pulley, down a chute on to a return conveyor underneath the floor.

The hoppers over the moulding machines have a capacity of 50 cub. ft. The ten moulding machines are grouped in two batches of five; one group for cope moulds and the other for drag moulds. Each group has two Milwaukee No. 163 arm-type jolt-squeezing strippers to take small 17-in. by 13-in. flasks and then three Milwaukee car-type jolt-squeezing strippers for flasks 32 in. by 20 in. Fig. 1 shows small machines and Fig. 2 the larger machines. Sand is discharged through air-operated gates into the flasks and any strike-off spillage sand falls on to a grating floor, and is guided by chutes on to the return belt underneath.

Cast-iron pattern plates are used with bronze patterns mounted on them. The small cope and drag machines have the flasks removed from the stripping frame by

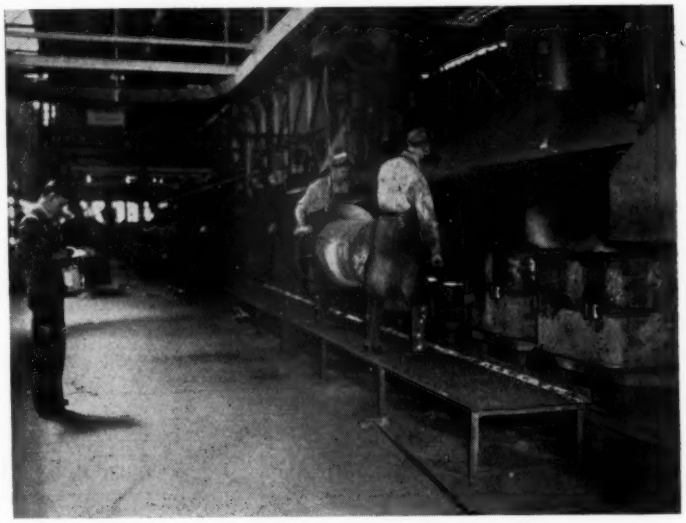


FIG. 3.—POURING MOULDS FROM BARREL-TYPE LADLE CARRIED ON OVERHEAD HOIST. NOTE THE FUME-REMOVAL HOOD AT THE POURING STATION.

Modern Australian Grey-iron Foundry

hand and the moulds are then placed on to the mould conveyor. On the large machines, the flasks are lifted off the stripping frame by an overhead platen car on the machine and placed on a roller conveyor behind the machine, and are then transferred from the roller conveyor by a hoist on an overhead gantry and placed on the mould conveyor (Fig. 2). Here the moulds are sprayed and a skin-drying operation is carried out, gas torches being used to supply the necessary heat.

Core-setting and Pouring

The gap between the cope and drag machines is the core-setting area. Large combination cores, such as cylinder-block, cylinder-head and transmission-case cores are assembled in jigs beside the mould conveyor and then placed in the drag moulds with any necessary chaplets. As the drag moulds pass the cope machines, small cope moulds are placed on the small drag moulds by hand, and the large cope moulds are lifted and placed on the large drag moulds by the overhead gantry hoists. Wedges are then clamped on to keep the flasks together. Immediately after the last drag machine the mould conveyor enters the pouring zone. The metal is poured from the barrel ladles travelling along the monorail. At a later date, the speed of the ladle will be synchronised with the speed of the mould conveyor.

Cooling and Knock-out

After the metal is poured (Fig. 3), the mould conveyor enters a cooling exhaust hood and, as it passes an opening half-way along the hood, the clamps are removed and the boxes are parted. Once more there is a further section of exhaust hood and the flasks come into the open again in front of the cope shake-out screen. The cope flask is lifted off with a barrel-type air hoist and placed on a 6-ft. by 3-ft. Simplicity-type vibrating shake-out. Sand from the shake-out passes through a chute on to a 10-ft. long belt feeder conveyor which again spills the sand on to the main return belt.

The flask is pushed off the shake-out by an air pusher on to a gravity roller conveyor which runs beside the cope moulding machines. Air hoists on monorail trolleys lift the flask off the roller conveyor and place them on the moulding machine table.

In the meantime, the drag flasks with the castings enter another exhaust hood immediately after the cope shake-out. On emerging out at the other end of the hood, large castings (blocks, heads and transmission cases) are lifted out of the flasks by a drum-type air hoist and hung on the hooks of the pendulum conveyor directly over the mould conveyor. Small castings are dug out of the drag flask with a fork and pushed down a chute on to a 36-in. wide 40-ft. centres, steel apron conveyor running at 30 ft. per min. As the drag flask comes in line with the drag shake-out, an air pusher pushes the flask off the mould conveyor on to the shake-out and again another pusher shoots the flasks off the shake-out on to the gravity roller conveyor and the flasks are fed in the same way to the moulding machines as the cope flasks.

The mould conveyor is a car-type conveyor running in a horizontal path, being 178 ft. between centres of turns which have 10-ft. radii. It operates at speeds variable from 7 to 14 ft. per min., giving capacities from 100 to 200 trays per hr., with one mould per tray. The trays are made of cast iron, weigh 300 lb. each, and are 24 in. wide by 45 in. long placed at 48-in. pitch on the conveyor. The small castings having fallen on to the underground apron conveyor are carried up on a gradual incline and spilled on to a shake-out screen which shakes off all the sand and breaks off most of the gates, sprues and runners. The screen is inclined and the castings vibrate to the lower end. An attendant rakes the castings into baskets and a drum type of air hoist lifts the baskets and conveys them *via* a monorail to a pendulum conveyor where the baskets are hung on the conveyor hooks.

To conclude the moulding-sand system, up to this it has been pointed out that all excess sand from the overhead conveyor, the sand spillage from moulding machines, the sand from cope, drag, and small castings shake-outs have all been discharged on to the return conveyor 24 in. wide by 138-ft. centres. This return belt passes over a magnetic pulley where all tramp iron is separated from the sand and the sand is spilled into the boot of a bucket elevator with 55-ft. centres and operating at a speed of 250 ft. per min. with buckets

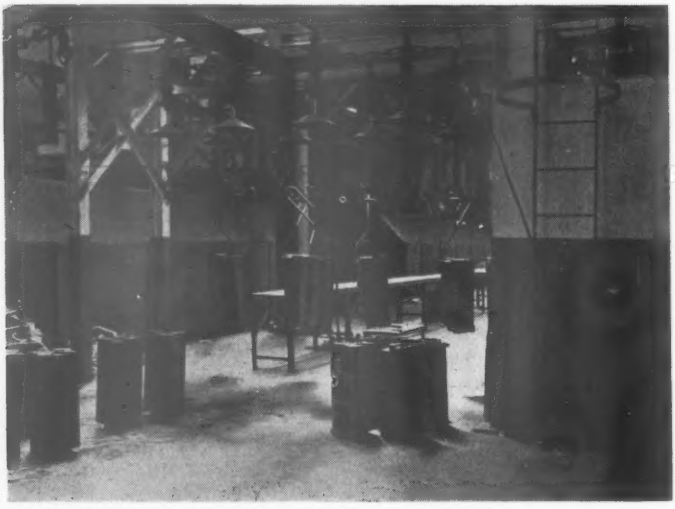


FIG. 4.—MONORAIL PENDULUM CONVEYOR FOR TAKING THE LARGER CASTINGS THROUGH THE AUTOMATIC SHOT-BLAST CABINETS.

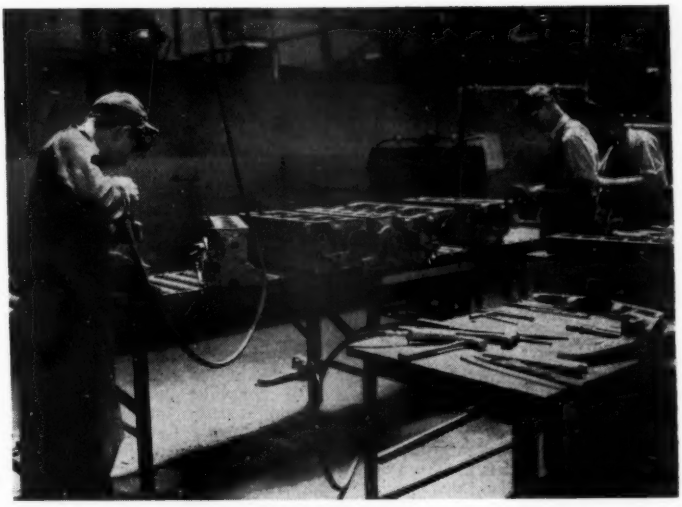


FIG. 5.—GRAVITY ROLLER CONVEYOR FOR FINAL CLEANING AND INSPECTION OF THE HEAVIER CASTINGS.

52 per cent. full. The sand is discharged from the head into a hexagonal screen and graded back into the 150-ton storage bins. The hexagonal screen removes all oversize pieces and lumps which pass through a refuse chute to a hopper on the floor.

Fettling

Returning to the castings, it has been stated that the large castings are hooked on the pendulum conveyor and small castings in baskets are hooked to the same conveyor. This conveyor has hooks spaced at 32-in. centres and the loading is in the sequence, casting-basket-casting. The hooks are at the low level of 6 ft. 6 in. above the floor near the drag shake-out where the casting and the baskets are hooked on; it then rises steeply to the ceiling height and turns into the cooling room. The floor of the room has steel plate and the walls are corrugated asbestos sheeting, going right up to the roof.

On the last straight run, before the exit from the room, the large castings are taken off the conveyor by drum-type air hoist and put on a gravity roller conveyor. On this conveyor all fins, risers, etc., are removed. The castings roll on to a mechanical knock-out, where all burnt moulding sand, internal core sand and wires are knocked out. Another air hoist lifts the castings off the knock-out and hangs them back on the vacant hooks on the conveyor and they immediately emerge from the cooling room.

The sand that has been knocked off falls down a chute on to a 4-ft. by 8-ft. screen, where large lumps of burnt core sand rumble down to a flap catcher. The smaller sand falls through the screen on a belt conveyor 24-in. by 12-ft. centres. This belt has a magnetic head pulley to remove magnetic metallic material. The sand is discharged into the boot of a bucket elevator having 37-ft. centres. This elevator discharges the sand into a 15-ton bin outside the building. A truck can be driven under the bin where, upon opening a rack and pinion gate, the sand spills into the truck and is taken away to be scrapped. At a future date, part of this knock-out sand is to be reclaimed and diverted back to the main return belt.

Once more returning to the castings, after they have emerged from the cooling room, they travel along the south wall at ceiling level; then, upon turning north, the conveyor dips and passes over a steel sorting table. The operator on the sorting table releases the catch on each basket as it passes over the table, whereupon the castings spill out in a heap. The operator, using a steel rod, sorts out the castings and pushes them down their correct chutes; one chute is reserved for gates and sprues. The castings then fall into dump hoppers. A Yale lift truck picks up a dump hopper and, depending on what castings are in the hopper, either takes them to a rumbler or to a Wheelabrator Tumblast plant.

Attendants on the lift truck, when handling the dump hoppers, release a catch on the hopper base, whereupon the hopper body rolls along its base, the body tilts and spills the castings out. Castings, after having been rumbled, are tipped out of the rumbler into hoppers and the lift truck transports them to the grinders. The grinders each have hoppers into which the castings are tipped from the dump hoppers. The same procedure holds when the castings have been Tumblasted. The hoppers over the grinders are self-feeding hoppers. After the grinding operations, the castings are inspected and—in the case of manifolds—air-tested under water. They are then put in standard tote pans and stored in the shipping area under the mezzanine floor. From there they are transported by lift trucks. In future, a rail trolley will probably be used.

Large castings pass over the sorting table and immediately drop down to within 5 ft. above floor level. They are then unhooked, air-hoisted and stored in their respective types of trays and in tiers. After this point, the conveyor climbs steeply to ceiling height, travelling at this height till it again dips down above the drag shake-out. From storage, the blocks, heads or transmission cases are then hooked on to the monorail conveyor (Fig. 4) of the Wheelabrator Rotoblast. They then disappear through the rubber flaps of the Rotoblast cabinet. After having been shot-blasted, they emerge through the exit flaps and are unloaded off the opposite side of the conveyor and put on a gravity conveyor (Fig. 5). They are then inspected—cylinder heads which have not been thoroughly cleaned in the deep cavities are put through the Granowski shot-blast. Heads and blocks are both put through the water-test fixture and, after this final inspection, are stored in the shipping area.

Modern Australian Grey-iron Foundry

Core Shop

Two grades of core sand are delivered by motor trucks and discharged into either of two wet-sand storage bunkers. Each bunker has a capacity of approximately 130 tons. It is then picked up by the 34 cub. ft. clam-shell bucket, operated from the 5-ton overhead crane, and discharged into the hopper over the sand drier. A scraper conveyor feeds the wet sand from this 15-ton hopper into the feed chute of the sand drier. This is a rotary louvre-type of sand dryer fitted with an oil-fired combustion chamber. The total length is 20 ft., but only 15 ft. is used for drying, the remaining 5 ft. being for cooling. Operating temperature for drying is 350 deg. C. and for the cooler 100 deg. C.

There are four storage bunkers for dry sand, two for each type of sand. Sand is delivered from the sand dryer by a swivelling belt conveyor into any of the four bunkers. The hot sand is given time to cool while sand is taken from the bunker that has the coolest sand. This cool sand is picked up by the grab and discharged into either of two overhead 15-ton core-sand distribution hoppers. Sand is fed from either of these hoppers by a vibratory feeder into a weigh hopper, then to a 13 cub. ft. batch-type, paddle, core-sand mixer and also to an intensive mixer. Prepared core sand is taken from these mixers in a drop-bottom bucket and delivered *via* monorail to hoppers over core blowers and core-making benches.

All small and medium cores are made in 92, 192 and 193 Osborn core blowers and on the benches by hand. There are also two hand roll-over and core-draw machines and two or three stationary core-draw machines. The cores are then taken to the batch-type of core oven. Three ovens form a battery 19 ft. long, 9 ft. wide and 8 ft. high. Each oven can accommodate one core rack, 4 ft. by 6 ft. by 6 ft. high. The ovens are heated by means of an oil-fired external re-circulating system—the heater having a capacity of 1,000,000 B.T.U. per hour.

The large cores are made on the 194 Osborn core blower, and drawn on a special roll-over core-drawing machine. These are baked in the vertical core oven. This oven has an oil-fired heater with a capacity of 1,500,000 B.T.U. per hour. Heating is by a fully-enclosed, convection-type re-circulating system and forced cooling system. The oven housing is 10 ft. by 10 ft. by 39 ft. high. Cores from the ovens are then taken to gravity conveyors, where they are inspected, gauged, rubbed, pasted and assembled, and then sent to another single-compartment drying oven, and from the oven to the moulding section. A standard type of rack is used in the core shop for storing, baking and transporting cores.

Other Departments

There is very little to describe in departments such as maintenance, pattern repair, pattern storage, inspection, laboratories, supply store, and general offices. Equipment is similar in these departments to any other large foundry.

Ventilation

There are no special facilities for general ventilation, as the type of roof construction used adequately handles the exhaust of contaminated air from the foundry. Fresh-air inlets are provided by the open windows and doors. Therefore, no foundry air is re-circulated. There is a hanging partition between the core room and moulding section. This partition hangs from the roof to within 8 ft. above floor level, thus preventing heat, dust and fumes passing from the moulding section to core room and *vice versa*. Also, the castings cooling room is sealed off. The walls of this room are continuous from the mezzanine floor right to the roof covering. Natural exhaust outlets in the roof ridge look after the heat fumes from castings and dust from the knock-out.

Local exhaust ventilation systems include hoods and enclosures at the points of dust generation, these being connected by suitable exhaust ducting to air-flow producing equipment, and finally, where necessary, through the air-cleaning equipment. This equipment consists of two 30,000 cub. ft. per min. Multi-Wash collectors and one 2,000-gall. louvre-type settling and water re-circulating tank. One collector handles the dust-laden air drawn from the following points in the moulding section:—Cope shake-out hood; cope shake-out hopper; transfer from cope shake-out belt feeder to return belt conveyor; drag shake-out hood; drag shake-out hopper; transfer from drag shake-out belt feeder to return belt conveyor; magnetic pulley and elevator boot; top of elevator; hexagonal screen; discharge from screen to storage bins; storage bins, two 8-ft. mills (not including cooling exhaust); small castings hood; small castings chute; and small castings shake-out.

The second collector handles the dust-laden air drawn from the following points in the fettling area:—Core knock-out hood; core knock-out hopper; discharge of conveyor under knock-out to elevator; top of elevator and bin; shot blast; two grinders; rumbler; rotoblast; tumblast; and sorting table. The pouring station exhaust is handled by means of a 30-ft. long hood with two exhaust fans and stacks through the roof. The mould conveyor exhaust is handled by two continuous hood enclosures, one from the pouring zone to the cope shake-out, the second from the cope shake-out to drag shake-out. Each section is provided with exhaust fans and stacks through the roof. The electric furnace has a local exhaust ventilation system which gives a positive exhaust of dust, fumes and smoke from the electrodes, roof openings, slag and pouring spouts. A hood covers the furnace roof, with a duct from the hood to the exhaust fan, and a stack from the fan through the roof. Dust, smoke and fume-laden air from the cupolas is filtered through water-spray screens in the dust arresters on the cupola stack. This water then returns by gravity to a 2,000-gall. settling and water re-circulating tank.

Lighting

In laying out the equipment, natural lighting was a big factor in determining the positions of machines and work benches. Machines were located relative to windows so that workers would face neither the light nor sunlit external surfaces. All machines and equipment were painted a light grey—which helped considerably in lighting the interior, this being of importance to the comfort and eyesight of the operators. For general artificial illumination, 750-watt, 18-in. enamelled iron, deep-bowl dispersive reflectors were used. Eight of these fittings per bay of 2,000 sq. ft. provide an even illumination of 25-ft. candles at working level.

Amenities

As reduction in absenteeism and an increase in the amount and quality of production depends on the good health and well-being among employees, provision was made for messroom, lockers, changing rooms, washing and toilet facilities, and drinking fountains. Gas, water, air and fuel-oil services are taken into the building through a centralised control recess. A standard ring

(*Continued on page* 348)

Work in a Jobbing Foundry

By J. F. Dowell and H. London

This Paper, read before the Scottish branch of the Institute of British Foundrymen, is a factual account of the making of a wide variety of castings which forms the day-to-day business of a jobbing foundry attached to a general engineering works. A comprehensive review is given of methods of tackling the out-of-the-ordinary jobs, of working with a minimum of pattern equipment and of the application of green-sand, loam-sand and dry-sand moulding each to its respective class of product.

THERE is no place in the foundry industry where the skill of the moulder or the ingenuity of the foundry technician is called into play so much as in the cast-iron jobbing foundry, for it is here that each job must be considered individually as regards the service conditions, the iron required, gating and feeding methods, sand, etc. Science must work hand in hand with the experience and skill of the moulder but, needless to say, arguments arise (thankfully with no tinge of bitterness) and it is found quite often that science has to knuckle down to experience—and quite often for the better. Thus, constructive criticism is given by both sides and the outcome is usually a good association of ideas for the production of a better casting. However, many of the more elderly and rule-of-thumb moulders are heard to say, much to the annoyance of the despairing chemist or metallurgist, "we produced better castings fifty years ago without the chemist—why do we need him now?" The answer (or is it an excuse?) to this is that the types of iron called for nowadays have more exacting service conditions required of them. One only has to examine the latest British Standard Specifications to realise this.

However, it is not the Authors' intention to dwell upon this line of thought but to relate their experiences in a jobbing foundry and to try and present some of the various jobs they have encountered. The jobbing foundry in question is attached to a general engineering works producing various types of chemical plant and as a result is called upon to make many varied castings including high-pressure and vacuum castings, papermaking-machinery castings, not to mention odd jobbing castings. The work thus ranges from very light castings up to heavy castings where various compositions have to be melted and a wide range of physical properties is required, calling for the use of either green-sand, dry-sand or loam moulding.

It will not be possible to deal with all of the castings representing, say, a day's run, but the examples taken will represent some of the typical ones and by these it is hoped to illustrate the range. Furnaces, sand-preparation plant, etc., will be described subsequently, and the Authors hope that some of the information contained in this Paper may, in some small way, help in solving the problems of others.

Green-sand Moulding Department

The Authors were recently called in by a local shipping engineer to replace a ship's broken bollard. The bollard was asked for within two days' time as the ship had docked on the Wednesday and was due to sail on the Saturday afternoon. Obviously, there was no time for the construction of a pattern and hence the broken bollard was used for this purpose. Fig. 1 shows the mould just after the broken pieces had been removed. The casting was run and gated in the flange, the runner acting as a feeding head and the whole was rod fed. The metal used was the ordinary grey iron used in normal practice. The finished, fettled casting is shown in Fig. 2 and was delivered to time.

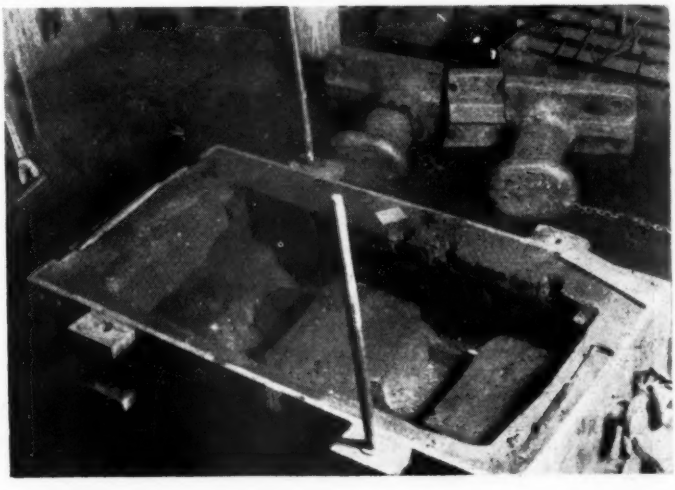


FIG. 1.—BROKEN BOLLARD FROM A SHIP USED AS A PATTERN FOR A REPLACEMENT CASTING.

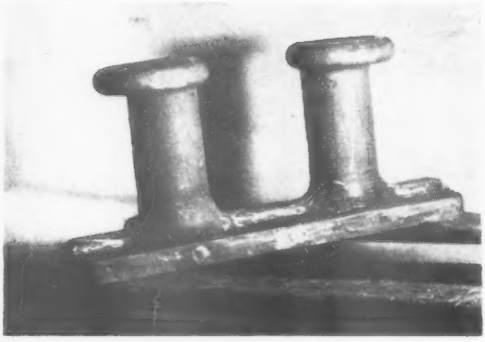


FIG. 2.—THE CASTING REPLACING THE BROKEN BOLLARD SHOWN IN FIG. 1.

This is but one instance of a job having to be completed in a short time for shipping requirements. There is on record another instance when a gear lever was required urgently for a ship lying off shore. Once again the broken part was used as pattern and the casting was supplied.

Cylinder Ends

One of the regular jobs received is that of moulding and casting cylinder ends, these being fitted to the paper-drying cylinders which will be described when dealing with loam moulding. The diameters of these cylinder ends vary from 3 to 5 ft. and the finished weights from 10 to 22 cwt. The pattern used is a metal one, fitted with a wooden trunnion. The mould is made in a special box with a chimney piece to take the trunnion, allowing only the minimum of sand around it. After ramming the drag, the box is inverted and sunk below floor level with the trunnion downwards. The top is then rammed up and a special provision is made for the vent from the centre core of the trunnion. The job is then parted and the pattern is removed in the usual manner.

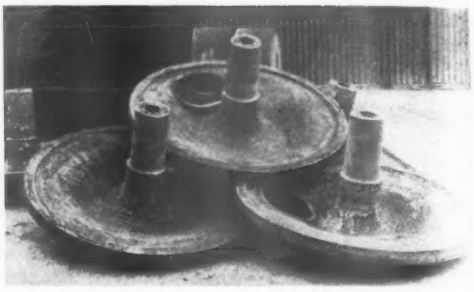


FIG. 5.—FINISHED CYLINDER-END CASTING.

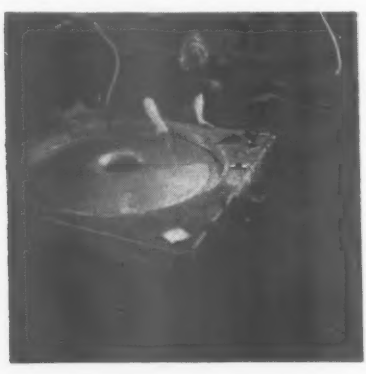


FIG. 3 (*left*).—SINKING THE DRAG-HALF MOULD FOR A CYLINDER-END CASTING.

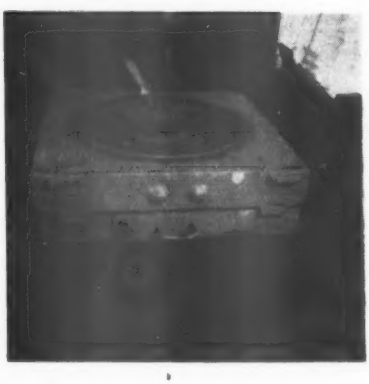


FIG. 4 (*right*).—SMOOTHING THE TOP-PART MOULD FOR A CYLINDER END.

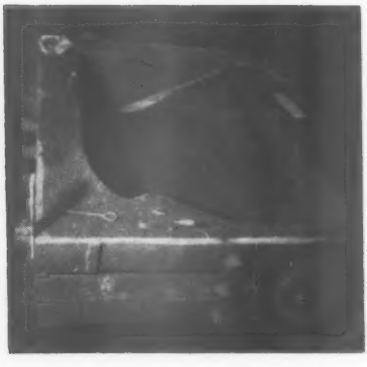


FIG. 6 (*left*).—COPE-HALF MOULD FOR ANGULAR TANK PLATE.

FIG. 7 (*right*).—DRAG-HALF MOULD FOR THE ANGULAR TANK PLATE.

FIG. 8.—FINISHING STAGES OF A TOP-PART MOULD FOR VAT CASTING.

Before the mould is re-assembled, pieces of "tin" are "tacked" on the mould where the trunnion fillet sweeps into the main casting. This is found to be necessary to prevent scabbing and sand washes. Figs. 3 and 4 show, respectively, the drag half being "sleeked" and the top part being smoothed off. The ingates are placed 6 in. from the side of the casting and the risers at the corners of the box leading off the rim of the casting. Two heavy risers feed the boss in the centre and are rod-fed, and it is invariably found that fresh metal has to be added every few minutes as shrinkage is most pronounced. Fig. 5 shows one type of finished cylinder-end casting.

Tank Plates

Castings the Authors are often called upon to make are tank plates. These are mainly 4 ft. 6 in. square and are designed so that the fillets are cast on and the bolt holes are cored out and afterwards machined to correct size. Some of the plates are not so regular, however. Occasionally, bend plates for tank corners have to be cast and for this purpose the mould is swept up in green-sand. A skeleton pattern is used and Figs. 6 and 7 show the mode of construction. (Fig. 6 shows a drag view of an angular bend plate and Fig. 7 shows a view of the cope half.)

Green-sand Moulded Vats

It will be recalled that castings for the papermaking industry were listed as one of the many types regularly

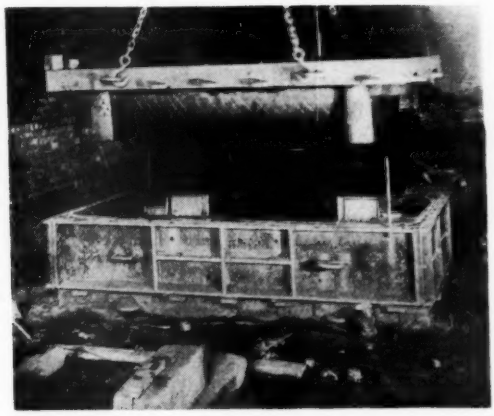


FIG. 9.—CLOSING THE MOULD FOR A VAT CASTING.

made. One of the largest is the vat used in the pulping process. It is made from an iron pattern, with wooden fittings to form the inlet and outlet ducts, and is so constructed as to form its own core, this being lifted in the top part. Fig. 8 shows the top part in the finishing stages while Fig. 9 shows the mould being closed. The metal is run in through the main body and core and then rises up the sides. Fig. 10 shows the finished casting.

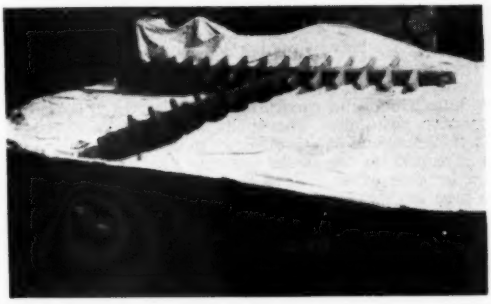


FIG. 11.—DRAG PART OF A PIPE MOULD SHOWING THE CORE IRON READY FOR PLACING.

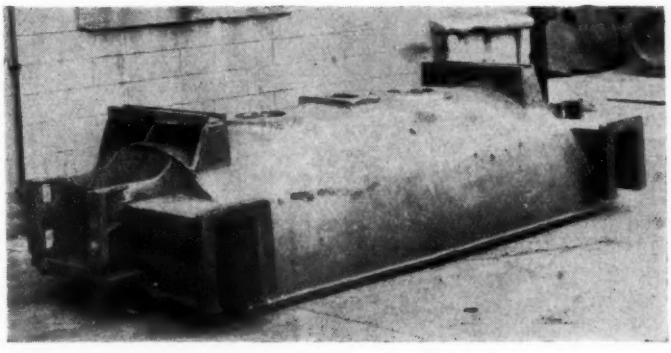


FIG. 10.—FINISHED VAT CASTING.

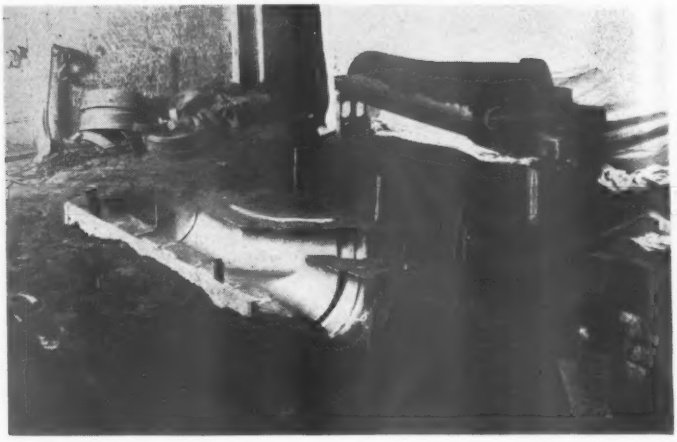


FIG. 12.—PIPE MOULD READY FOR CLOSING.

Pipe Moulding with Shell Patterns

The method of moulding pipes of various sizes using shell patterns is not so common as one would be led to believe and is unusual in the fact that the moulder is without pattern or corebox. It has been used quite extensively in the Authors' foundry in the last few months, due to the fact that one of the pattern stores in which many hundreds of patterns were stored was destroyed by fire. The method is economical because it saves pattern-making time, although the actual moulding time is slightly increased, and it shows improvisation in a jobbing foundry at its best.

The method is briefly as follows:—The pipe-section is drawn full size on a board which is received from the patternshop and carries the flanges screwed in their respective positions. The shells, of the required size and thickness and cast previously in open-sand moulds, are mounted on the board and are kept in alignment by a beading which follows the contour of one side of the pipe and which runs from one flange to another. The bottom part of the moulding box is then placed over the shell pattern and rammed up, the box is turned over, bedded in the floor up to the parting line and the board is withdrawn. The core iron (previously cast in an open-sand mould by chalking the contour of the pipe drawn on a board and stamping it in a prepared sand bed) is then laid in place and rammed to the joint. The next step is to set the top flanges and shells, the top half of the core being progressively rammed under the latter. When this has been done, the cope is rammed up as usual. The mould is then parted; the top shells are withdrawn, the core is lifted out and the whole is finished off as with an ordinary mould. Fig. 11 shows the drag part of the mould and the core iron ready for positioning, whilst Fig. 12 depicts the finished mould prior to closing.

Pipe Moulding Using Loam Pattern

Another unusual method of moulding cylindrical pipes which has likewise been put to good use recently, following the pattern-store fire, is the use of a loam pattern. The core is swept up first of all on the core bar, using straw rope and loam, and is brought up to the requisite size and shape by use of board shaped as required. It is then stoved and when dry is given a coating of blacking and afterwards re-stoved. The actual thickness is then swept up on to the required shape and the whole is thoroughly dried as before. Next, the pattern and core are placed in the moulding box; Fig. 13 shows a typical loam pattern and core with the drag completed and ready for ramming up the top part. After the moulding has been completed, the loam work constituting the thickness of the casting is chipped off (it strips off quite easily due to the

FIG. 13.—PIPE MOULD FORMED FROM A LOAM PATTERN, WHICH AFTER STRIPPING IS USED AS THE CORE.

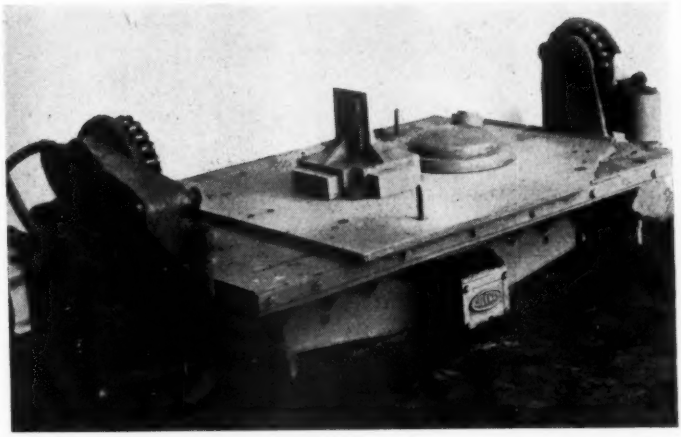


FIG. 14.—PATTERNS FOR A BRACKET AND GAS-CONDENSER TOP PLACED ON THE TABLE FOR MACHINE MOULDING.

coating of blacking around the core) and the core is replaced in the mould prior to closing. It can be realised, of course, that flanges may be made as required from wooden patterns and added where required.

Machine Moulding

Not all of the work in the green-sand department is carried out by hand, for two moulding machines are available for some repetition work. There is a large machine having a plate 6 ft. by 4 ft. and the smaller machine has a plate 3 ft. 6 in. by 2 ft. Considering the larger of the two machines first; this has been used for moulding castings of various sizes and shapes, but the castings the manufacture of which is to be described now are a bracket for a plate column for gas purifiers and a top for a gas condenser.

Fig. 14 shows the patterns placed in position on the plate and it may be seen that they are loose; the locating pins for the box are clearly visible. The castings were made together in a box 36 in. by 30 in. by 12 in. deep and Fig. 15 shows the box rammed up and almost ready for removal from the plate; it will be noticed that the box is held in position by means of a key fitting through a slot in the locating pins. Fig. 16 is a close-up view of the patterns ready for drawing and Fig. 17 shows the mould ready for the placing of the cores prior to closing; the sprues for risers and gates are indicated. The finished castings are illustrated in Fig. 18.

The smaller moulding machine is used to some extent for small plate work and the example illustrated here is typical. The pattern in this instance is fixed to the plate and is drawn by the machine. Fig. 19 shows the mould just after withdrawing the pattern (which is of wood), and once again the slotted locating pin may be seen. Fig. 20 shows some of the moulds with ingates cut, prior to closing.

Smaller Castings

So far, some of the medium-size castings made by green-sand moulding have been cited but Fig. 21 shows some typical examples of the smaller castings manufactured, and these serve to illustrate the range of the

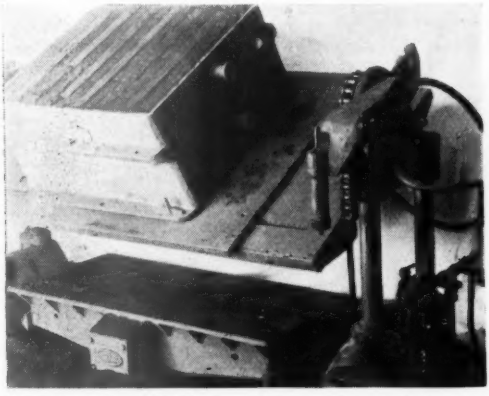


FIG. 15.—THE RAMMED-UP BOX FROM THE PATTERNS SHOWN IN FIG. 14.

FIG. 16.—MOULD FOR GAS-CONDENSER TOP AND BRACKET PRIOR TO THE WITHDRAWAL OF THE PATTERNS.

FIG. 17.—MOULD READY TO RECEIVE THE CORES.

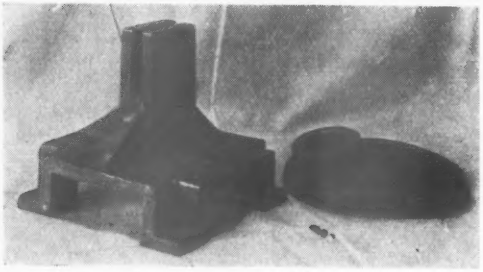


FIG. 18.—FINISHED BRACKET AND GAS-CONDENSER TOP CASTINGS.

castings that have to be made. Small though the castings may be, they too are considered singly and often require more careful study than some of the larger jobs. The castings illustrated include mould holders for a bottle-making machine, steam traps and a manhole cover for a vacuum stove.

FIG. 19.—MACHINE MOULDING OF PLATE CASTINGS.

FIG. 20.—PLATE MOULDS WITH INGATES CUT AND READY FOR CLOSING.

FIG. 21.—GROUP OF MISCELLANEOUS SMALL CASTINGS.

FIG. 22.—GROUP OF CORES FOR JOBBING FOUNDRY WORK, WITH (RIGHT-HAND SIDE) EQUIPMENT FOR A PIPE BEND CORE.

Core Making

Fig. 22 shows a range of oil-sand cores made for a jobbing foundry. Among these, on the right-hand side, is shown equipment for an unusual method of moulding cores for a pipe bend tapering from 6 in. to 4 in. The skeleton pattern is shown beside the two moulding boxes in which the core is made. The method of making the core is to draw the section of the part full size on a wooden board, the area representing the core being cut away as indicated. The board is placed over a moulding box rammed up with oil-sand and the space to take the core is "strickled out" by means of a 90 deg. square supplied; in this way the core former is swept up true. Parting sand is introduced and the bottom half of the core is then rammed up, vents, etc., being cut as required. After drying, the core may be lifted out and glued to the top half core which is made in the same manner by reversing the board. This method of forming such a core is important in that patternmaking time is saved when the casting is of the "one-off" type.

Dry-sand Moulding of a Jacketed Cylinder

Castings to be used for high-pressure work, vacuum stoves, or high-duty purposes, are usually made in the dry-sand section. Among these may be included the jacketed cylinder the moulding of which is to be described. In actual fact, the casting is an air pump around which is a water-cooling jacket, the whole forming one casting.

The moulding was carried out in dry sand but involved the making of two almost totally-enclosed cores (*a*) the core forming the barrel and (*b*) the core forming the water jacket. Because of this, a special core sand was prepared for the job; the sand was given extra milling, with a semi-solid binder to give a good strong bond and the green cores were given a long bake at a lower temperature than usual to ensure thorough drying and the minimum of residual volatile matter. There were no unusual aspects in the moulding of the barrel, apart from the fact that the mould was well-vented, but the making of the water-jacket core provides an interesting study. The core was made in two halves, each half being formed around a wire cage made up with mild-steel wire bound at the joints with fine wire and the whole fitting into the core box. The core sand was filled around the cage and strickled to shape. Venting was effected by wax vents placed parallel to the lifting handles. Fig. 23 shows the mode of construction; attention is drawn to the core box and the positioning of the lifting handles on the unfinished and the finished core. After lowering of the barrel core into position, the ingates are cut and the metal run in from both the top and the bottom, the mould having previously been turned on end.

(To be concluded.)

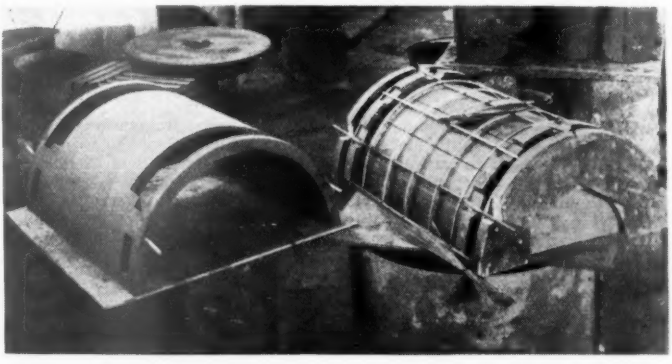


FIG. 23.—METHOD USED FOR MOULDING A JACKETED CYLINDER.

Canadian Railways Seek U.K. Goods

A long list of goods required by Canadian railways—Canadian Pacific and Canadian National—has been circulated by the Ministry of Supply. In addition to railway equipment and accessories the list mentions many other items. Large quantities of equipment are imported by Canadian railways annually; in the past, British participation in this trade has been small, but the two rail systems are now eager to obtain United Kingdom sources of supply.

The Ministry of Supply believes that, if U.K. manufacturers can satisfy Canadian technical requirements and standards, and their goods are suited to the climatic and other conditions in the Dominion, Britain's share of market—which is, of course, an important dollar market—should be greatly increased. It is pointed out that most of the equipment needed by the Canadian railways is of different design and specification from that used in Britain, and the overseas markets which British manufacturers serve.

Included in the list of requirements of the Canadian railways are the following:—

Air-conditioning sets (mechanically operated); air-conditioning grilles for coaches; wrecking cranes; stokers (for locomotives and for power plants); ball and roller bearings; cylinder cocks for steam locomotives; batteries (track signal and car lighting); steel platforms, steel running boards, and brake sets for cars.

Air-conditioning control equipment; tube cleaners; electric water coolers for cars; machines, drilling, track, and bonding; welding equipment and supplies; telegraph equipment accessories; Diesel locomotives; oil-burning equipment; heat-treating furnaces; crack-detecting equipment.

Coal (bituminous and anthracite); pneumatic tools; machine tools; track chisels; signal material; jacks, track, etc.; mechanical lubricators, voltmeters; ammeters; generator drives; rivet snaps; pipe wrenches; blast-cleaning equipment; crossing gates mechanism; firebricks; fireclay; foundry sand; plymetal.

Further information can be obtained from the London representatives—Mr. F. Fawke, purchasing agent, Canadian Pacific Railways, 62, Trafalgar Square, W.C.2, and Mr. J. B Thom, European manager, Canadian National Railways, 15-19, Cockspur Street, W.C.2.

Nickel Company's Earnings

A contraction of $(U.S.)6,856,090 in the net profit of the International Nickel Company of Canada, Limited, is shown in the accounts for 1949. Last year's net profit was $32,252,314, compared with $39,108,404 in 1948, equal to $2.08 ($2.55) per common share.

A joint statement from Mr. Robert C. Stanley, chairman, and Dr. John F. Thompson, president, explains that unusual fluctuations in the demand for nickel products last year were caused by inventory adjustments by the consuming industries, stoppages of work in the steel mills, and uncertainties in the US business outlook. Nickel sales declined by 30,806,017 lb. to 209,292,257 lb.

The statement points out that costs of labour, supplies, and services continued to move upward. Increases in costs added substantially more to the total costs of all metals sold than the company received during the year by reason of the upward adjustments in its prices for nickel, which have been in effect since the last half of 1948. Lower prices prevailing for copper and platinum metals, together with the increased costs and reduced volume of nickel products sold, resulted in lower net earnings than for the preceding year.

Proven ore reserves at the end of the year stood at 251,805,000 short tons, compared with 246,177,000 at the end of 1948, with the nickel-copper content 7,630,000 short tons, compared with 7,503,000 at the end of 1948 and 7,171,000 at the end of 1947.

Budget Suggestions by E. I. A.

In its 1950 Budget representations to the Chancellor of the Exchequer, the Engineering Industries' Association urges cuts in taxation and Government expenditure, and suggests that the present policy of freezing wages, profits, and dividends hinders the productive effort. An increase in the earned income allowance, abolition of profit tax on undistributed profits, reduction of profits tax on distributed profits, reversion of surtax to its 1941-46 level, and a review of purchase tax are among some of the reliefs suggested by the Association. It believes that the operation of the nationalised industries would improve considerably with less red tape and unnecessary paper work, more responsibilities given to executives, and decentralisation, and also that it would be advantageous to set up a body of professional and business men to submit an unbiased report on these industries.

The Association considers that all further plans for nationalisation should be abandoned, and that no justification can be advanced for the nationalisation of the iron and steel industry.

Courses of Industrial Welfare

The first British Council course for oversea specialists in the 1950 programme—on "Industrial Welfare and Personnel Problems"—opened in London on March 14 with a visit to the Safety, Health and Welfare Museum. Industrial executives, Government factory inspectors, and other specialists in the subject from Austria, Germany, Greece, Italy, the Netherlands, Pakistan, Sweden, and Turkey inspected the permanent exhibition of methods and appliances for promoting the safety, health, and welfare of industrial workers. In the afternoon the members of the course travelled to Manchester where an extensive programme of lectures and visits had been arranged.

The director of the course is Dr. Arthur Roberts, head of the Department of Industrial Administration in the University of Manchester, which is the only university in Britain with a full-time department for the subject. Prof. R. E. Lane, Nuffield Professor of Occupational Health at Manchester University, whose Chair is the first of its kind in Britain, is dealing with health in industry.

Modern Australian Grey-iron Foundry

(*Continued from page* 340)

main has been installed and all equipment is fed from this ring main. All materials and equipment, when not in use, are to be stored in segregated storage areas provided for the purpose. This assists greatly in keeping areas clear for the maintaining of equipment and for efficient housekeeping. Also, with equipment being stored correctly, this prevents accidents.

Conclusion

Although the foundry described is modern and almost fully mechanised, its production of quality, closer tolerances, better finish and lower costs of castings will depend just as much, if not more, on the foremen than the machines. In the tryout and setting up of the foundry, it was evident that the facilities in a foundry are no better than the men operating them, and a trained and experienced foreman is the most important asset of the plant.

In conclusion, the Author expresses his appreciation to the management of General Motors Holdens, Limited, for permission to write this Paper, and for facilities afforded in its preparation.

Fuel Efficiency in the Iron and Steel Industry

Steady Improvement Resulting from New Techniques and Instrumentation

As the largest single consumer of fuel and power in this country, the iron and steel industry is deeply concerned in their efficient utilisation. Much progress has already been made and during the past 30 years the quantity of coal needed to produce a ton of finished steel has fallen from over 60 cwt. to well below 40 cwt. More precisely perhaps one should refer to these figures as the *average* consumption over the whole range of so-called finished steel, since obviously the degree of finish must have some bearing upon the fuel required to make a particular product. The subject of fuel efficiency is discussed in a lengthy article published in the February "Statistical Bulletin" of the British Iron and Steel Federation, it being pointed out that the output of finished steel per unit of fuel consumed has risen by nearly 70 per cent. since 1923 and by about 9 per cent. since 1938, despite the shift in demand to products requiring more fuel and the fall in coal quality.

Resumé of Essential Data

The annual consumption of coal, including coal for the production of coke, is about 26 million tons, while the industry now uses well over a million tons a year of liquid fuels, including tar, creosote-pitch and petroleum oils, a ton of which may be taken as roughly equivalent to 1.5 tons of coal. In addition, the industry is at present consuming nearly 5,000 million units of electricity annually, over one-quarter of which is generated in its own works; the quantity bought from outside is roughly equivalent to the purchase of an additional 2.2 million tons of coal a year. The usage of the main fuels in 1948 and 1949 is shown in Table I.

Value of Integrated Plant

One may readily appreciate the advantage of the integrated steel plant in the matter of heat conservation. At every stage in the making and shaping of a hot steel product the material must be maintained at a high temperature. Some loss of heat is inevitable in the passage from one process to the next, but much has been done to reduce such losses to a minimum. In a modern integrated plant the fullest use is made of the blast-furnace gases, representing on the average about 50 per cent. of the net calorific value of the coke consumed. The ancillary services of the blast furnace itself—air heating and blowing and the generation of electric power for local use—may utilise some 40 per cent. of the gas produced, leaving 60 per cent. available for other purposes. It is generally recognised that the most economical course is to use the surplus blast-furnace gas as a fuel for the coke ovens, which in their turn yield a much richer gas for use in the steel furnaces, reheating furnaces and elsewhere. Illustrating the value of choosing the correct fuel for a particular process, an interesting practical example is that of a well-known firm which changed over its rod reheating furnaces from coal to gas-firing. While the fuel cost per therm of heat was more than twice as high with gas-firing, the amount of heat consumed per ton of rods treated was reduced to one-third, with a resultant saving in costs of fuel of 3s. 3d. per ton, and an overall saving in heating costs of over 12s. 3d. per ton of rods treated. The fact that the capacity of the furnace was raised by 50 per cent. after the conversion provided an additional advantage, the economic value of which is more difficult to assess. While this is typical of the kind of saving possible when the most appropriate fuel is selected for any particular purpose, it is pointed out that part of the improvement in this case was attributable to a new furnace of better design, with automatic control.

TABLE I.—*Fuel Consumption in the Iron and Steel Industry. (Thousand Tons).*

	1948.	1949.
Coke :		
Blast furnaces	9,973.7	9,983.4
Iron foundries	837.5	844.5
All other uses	607.4	625.2
Total	11,418.6	11,453.1
Coal (other than coking coal) :		
Iron foundries	332.0	328.7
All other uses	8,829.8	8,640.0
Total	9,161.8	8,968.7
Liquid fuel :		
Tar	54.0	86.0
Creosote-pitch	109.0	160.7
Heavy fuel oil	845.0	897.5
Fuel oil		
Gas and Diesel oil*	15.7	16.5
Total	1,023.7	1,160.7

*Excluding consumption in internal-combustion engines.

Progress to Date

With these general considerations in mind, the article draws attention to the various ways in which fuel costs are being attacked in different sections of the industry, including blast furnaces, coke ovens, melting shops and rolling mills. Referring to the fuel economies effected during the past 20 or 30 years, it may be stated that precise comparisons over so long a period are somewhat difficult in view of inadequacies in the statistical material and the technical changes which have taken place in the interim; and the necessary data are not available for the war years. However, the best estimates that can be made are set out in Table II, in which full allowance is made for the increased use of oil. This shows that the industry's coal consumption per ton of finished steel produced fell from a peak figure of almost 63 cwt. in 1924 to less than 41 cwt. in 1938, with a further reduction to little more than 37 cwt. in 1949. Nearly 21 million tons of coal were required for last year's production of steel; the remainder of the iron and steel industry's coal consumption was used in the production of iron products, including the necessary foundry and forge pig-iron.

Current Problems

It is well advisable to consider the methods employed in tackling the problem of fuel efficiency, both from

TABLE II.—*Fuel Consumed in the Manufacture of Finished Steel.*

Year.	Coal consumed per ton of steel-making pig-iron (*b*)	Consumed per ton of finished steel.		Finished steel.			Total coal consumed per ton of finished steel.
		Pig-iron	Coal content of pig-iron.	Production (*a*).	Coal consumed (*c*).		
					Total.	Per ton.	
	Cwts.	Cwts.	Cwts.	Thous. tons.	Thous. tons.	Cwts.	Cwts.
1923.. ..	39.6	14.3	28.3	6,555	11,290	34.4	62.7
1924.. ..	39.1	15.3	29.9	6,259	10,340	33.0	62.9
1925.. ..	37.5	14.8	27.8	5,798	8,800	30.4	58.2
1926.. ..	43.5	14.6	31.8	3,003	—	—	—
1927.. ..	36.4	14.6	26.6	6,429	9,250	28.8	55.4
1928.. ..	36.9	14.3	26.4	6,437	8,370	26.0	52.4
1929.. ..	37.7	14.8	27.9	7,046	8,020	22.8	50.7
1930.. ..	37.5	14.0	26.3	5,423	7,100	26.2	52.5
1931.. ..	36.3	12.7	23.1	3,774	5,500	29.1	52.2
1932.. ..	35.7	12.3	22.0	3,923	5,160	26.3	48.3
1933.. ..	35.9	11.9	21.4	5,065	5,920	23.4	44.8
1934.. ..	37.7	12.6	23.8	6,223	7,020	22.6	46.4
1935.. ..	32.8	13.0	21.3	6,965	7,470	21.4	42.7
1936.. ..	32.0	13.2	21.1	8,291	8,250	19.9	41.0
1937.. ..	33.1	13.4	22.2	9,352	8,900	19.0	41.2
1938.. ..	32.6	13.0	21.2	7,381	7,180	19.5	40.7
1947.. ..	32.2	13.4	21.6	9,816	9,250	18.8	40.4
1948.. ..	31.4	13.3	20.9	11,106	10,260	18.5	39.4
1949.. ..	30.8	12.8	19.7	11,631	10,180	17.5	37.2

(*a*) Excludes material for intra-industry conversion and finished steel produced from imported ingots and semis, but includes wrought iron.
(*b*) Basic and hematite pig-iron.
(*c*) Includes the coal carbonised to produce the coke consumed and in 1948 and 1949 the thermal equivalent of the oil consumed in steelworks.

the standpoint of the individual firm and from that of the industry as a whole. As is often the case, the first difficulty is to get at the facts. How much fuel is actually being used by a given furnace? What is the true cost per ton of output? How does the performance of one firm compare with that of another? All such questions which arise in connection with fuel efficiency point to the imperative need for instruments, records and statistics. The key to the elimination of waste is often provided by better instrumentation, a practice which has been greatly extended in recent years and which has given rise to a new class of technician—the instrument mechanic. One well-known steelworks, where considerable fuel economies have been achieved, was recently reported to have some 1,500 separate instruments in use; these are maintained by a staff of 20 men, working in a fully equipped instrument repair shop.

So far as records and statistics are concerned, many of these are, of course, collected by the individual firms for their own use, so that the managements may keep a careful watch on fuel consumption and general efficiency over a period of time. The Federation performs a similar service for the industry as a whole, by collecting both cost data and statistics of production and usage of materials and fuel. The tabulated results are made available to all the firms making the return, so that individual managements may compare their own performance with that of other firms and of the industry as a whole. All the larger steel firms have fuel departments in which careful attention is paid to the whole question of fuel efficiency. The services of their fuel officers have been made available to the smaller units in the industry which cannot afford fuel departments of their own. This work is supplemented by the research staffs of the firms and of the British Iron and Steel Research Association.

Heating Appliance Efficiency

A programme that will help to increase and give steady employment to the foundry areas was announced in Glasgow on March 23, by Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee. He said the programme would be a long-term one for fuel appliances, heaters and cookers for Scottish houses and would probably involve a capital expenditure of £18,000,000 over a period of not less than 10 to 15 years. Most of this would be expended in connection with the construction of 500,000 new houses in Scotland and the reconditioning of 408,000 others. The Ministry of Fuel and the Department of Scientific & Industrial Research had tested 74 models of grates and appliances, samples of which were on exhibition at the Glasgow showrooms. Over 50 per cent. of the grates, heaters and cookers used in Britain were, he stated, made in Scotland ,principally in the traditional foundry areas. The Government had circularised local authorities to use "improved" appliances for new and old houses.

The Glasgow showrooms had been visited in one month by 2,000 architects, surveyors, engineers and local authorities. Use of these appliances, said Sir Patrick, would save coal. Scottish housewives used 80,000 tons per week, and it was easy to see that saving in domestic and commercial fuel consumption would make a larger quantity of fuel available for export.

College Principal Honoured

Principal J. Cameron Smail, who is retiring from the principalship of Heriot-Watt College, Edinburgh, has had the honour of Principal Emeritus conferred on him by the Governors. At a ceremony held in Edinburgh City Chambers, recently, he received gifts in recognition of his services to education and to the city. the gifts being handed over by Lord Provost Sir Andrew Murray, chairman of the Governors of the College, on behalf of students, parents of students, citizens, Edinburgh University, the College of Art. the Company of Merchants, Chamber of Commerce, Scottish Education Department, and the Royal Scottish Geographical Society.

Tribute to the work of Principal Smail was paid by Mr. Robert Wilson, vice-chairman of the Governors; Sir John Mackay Thomson, secretary of the Scottish Education Department, and Prof. M. E. Say, president of the Heriot-Watt College Staff Association.

Iron and Steel Institute

Annual General Meeting, April 26 and 27

The Annual General Meeting of the Iron and Steel Institute will be held in the Institute's offices, 4, Grosvenor Gardens, London, S.W.1, on Wednesday and Thursday, April 26 and 27. A buffet luncheon (tickets 6s. each) will be available in the library on both days, and there will be an interval during both mornings for light refreshments (no charge). A members' dinner (tickets £1 5s. each) will be held at the Dorchester Hotel, Park Lane, London, W.1, on April 27, at 7.0 for 7.30 p.m. In order to mark the centenary of the birth of Sidney Gilchrist Thomas on April 16, 1850, Mr. James Mitchell, C.B.E. (honorary treasurer of the Institute), will give a special commemorative lecture on April 26; this will take place in the offices of the Institute and will commence at 8.30 p.m.

Members intending to join in the discussion on the Papers and/or attend the buffet luncheons are requested to inform the secretary not later than April 18. Those wishing to take part in the members' dinner are asked to make application and send the appropriate remittance to the secretary as soon as possible. Members may bring guests, but ladies, other than members, cannot be invited.

Programme

April 26

10.0 to 11.0 a.m.—Official business; election of members; presentation of report of council and statement of accounts for 1949; presentation of the Bessemer Gold Medal for 1950 to Mr. James Mitchell, C.B.E. (honorary treasurer); presentation of the Sir Robert Hadfield Medal for 1950 to Mr. G. D. Elliot; presentation of an Andrew Carnegie Silver Medal for 1949 to Mr. N. H. Polakowski; presentation of the Williams Prize for 1949 to Dr. D. F. Marshall and Mr. H. C. White; presentation of the Ablett Prize for 1949 to Mr. E. L. Diamond and Mr. A. M. Frankau; induction of the new president, Mr. J. R. Menzies-Wilson, O.B.E.

11.0 to 11.45 a.m.—Presidential address.

12 noon to 1.15 p.m.—(i) Discussions on "Characteristics of Scrap in Relation to Bulk Handling," by E. L. Diamond.

1.15 to 2.30 p.m.—Buffet luncheon in the library of the Institute.

2.30 to 4.0 p.m.—(ii) Joint discussion on:—"The Overheating and Burning of Steel. Part III—The Influence of Excessive Reheating Temperatures on the Mechanical Properties and the Structure of Alloy Steels," by A. Preece, J. Nutting and A. Hartley; "The Detection of Overheating and Burning in Steel by Microscopical Methods," by A. Preece and J. Nutting; "Grain-boundary Phenomena in Severely Heated Steel," by T. Ko and D. Hanson; "A Note on the Overheating of Steel," by E. C. Rollason and D. F. T. Roberts.

4.0 to 5.0 p.m.—(iii) Discussion on "The Extension of the Ar_1 Range with Carbide Formation in Mild Steel due to High-temperature Treatment," by J. H. Whiteley.

8.30 p.m.—"Centenary of the Birth of Sidney Gilchrist Thomas." A commemorative lecture will be given by Mr. James Mitchell, C.B.E., honorary treasurer.

April 27

10.0 to 11.0 a.m.—(iv) Discussion on "The Influence of Low Percentages of Certain Elements on the Microstructure of Pure Iron-carbon Alloys and Cast Irons," by W. J. Williams.

11.30 a.m. to 1.0 p.m.—(v) Joint discussion on:—"The Thermodynamic Background of Iron and Steelmaking Processes. 1—The Blast Furnace," by F. D. Richardson and J. H. E. Jeffes. "The Influence of Gas/Solid Temperature Differences on Blast-furnace Operation," by J. Taylor.

1.0 to 2.30 p.m.—Buffet luncheon in the library of the Institute.

2.30 to 3.45 p.m.—(vi) Joint discussion on:—"Blast-furnace Gas Cleaning. An Analysis of Plant Performance," by R. F. Jennings. "Blast-furnace Gas Cleaning. Methods for Calculating the Motions of Particles in a Gas," by J. Stringer.

3.45 to 5.0 p.m.—(vii) Joint discussion on:—"Proposals for the Modification of a Blast-furnace Top to Give Controlled Burden Distribution," by E. L. Diamond. "A New Blast-furnace Stock-rod Gas Seal," by E. J. Walklate.

7.0 for 7.30 p.m.—Members' dinner at the Dorchester Hotel, Park Lane, London, W.1.

Honours and Awards

Mr. J. R. Menzies-Wilson, who has been elected president of the Institute, is a director of Stewarts and Lloyds, Limited, Glasgow, Scottish Tube Company, Limited, Glasgow, Stanton Ironworks Company, Limited, Nottingham, Union Steel Corporation (of South Africa), Limited, and a number of other companies.

The Institute's Bessemer Medal for 1950 is being awarded to Mr. James Mitchell, a director of Stewarts and Lloyds, Limited, for his distinguished contributions to the technical development of the iron and steel industry. Mr. Mitchell, who is chairman of the steelmaking division of the British Iron and Steel Research Association, is also honorary treasurer of the Iron and Steel Institute.

The Sir Robert Hadfield Medal for 1950 has been awarded to Mr. G. D. Elliot, of Appleby-Frodingham Steel Company, Limited, Scunthorpe, for his contributions in practice and theory to the development of blast-furnace operation.

Mr. N. H. Polakowski, an Andrew Carnegie Research Scholar, of University College, Swansea, is to receive the Carnegie Silver Medal for 1949 for his Paper on "The Compression Test in relation to Cold Rolling."

The Williams Prize for 1949 is being awarded jointly to Dr. D. F. Marshall and Mr. H. C. White, of the Park Gate Iron & Steel Company, Limited, for their Paper on "The Conversion to Oil Firing of the Open-hearth Furnaces at Park Gate Works." The Ablett Prize for 1949 is being awarded jointly to Mr. E. L. Diamond, of the British Standards Institution, formerly of B.I.S.R.A., and Mr. A. M. Frankau, of B.I.S.R.A., for their Paper on "Present Methods of Open-hearth Furnace Charging."

Symposium on Gas-turbine Steels and Alloys

Arrangements are in hand for a symposium on "High-temperature Steels and Alloys for Gas Turbines," to be held on Wednesday and Thursday, October 18 and 19, 1950. The sessions will take place in the lecture theatre of the Institution of Civil Engineers, Great George Street, London, S.W.1. A programme of some 25 to 30 Papers is in course of preparation. The Papers and discussions will be issued together in a bound volume as a special report. Orders for the volume (which must be accompanied by a remittance) received before the date of the symposium will be supplied at the reduced rate of £2 2s. per copy (post free), and those intending to attend the meeting who purchase a copy of the volume will be provided with a set of advance copies of the Papers. After the meeting the published price will be £3 3s. (post free). Advance copies will not be supplied separately. A dinner for participants in the symposium is being arranged at the Hyde Park Hotel, Knightsbridge, London, S.W.1, on October 18, 1950. In association with the symposium, the Fifth Hatfield Memorial Lecture will be delivered in London by Air Commodore Sir Frank Whittle, K.B.E., C.B., D.Sc., F.R.S., on the evening of October 17, 1950, at 8.30 p.m.

Personal

MR. A. G. COLSTON, MR. S. ROBERTS, and MR. A. R. NORTHOVER have been appointed directors of Hoover (Washing Machines), Limited.

SIR GEORGE NELSON, chairman and managing director of the English Electric Company, Limited, has joined the board of Lloyds Bank, Limited.

MR. DONALD BOXALL has been appointed export sales manager to Leyland Motors, Limited. He will operate from the London office in Hanover Square, W.1.

MR. T. H. EDWARDS, works manager for over 20 years of the Spitalgate Ironworks, Grantham, of Ruston & Hornsby, Limited, engineers and boilermakers, etc., has retired.

DR. E. H. T. HOBLYN has been appointed to succeed the late Mr. Norman Neville as director of the British Chemical Plant Manufacturers' Association and of the British Food Machinery Manufacturers' Association.

SIR JOHN CRAIG has been appointed deputy Governor of the Bank of Scotland. A member of the Council of the F.B.I., Sir John is chairman and managing director of Colvilles, Limited, and a member of the boards of many other companies.

MR. GEORGE GUMMER, chairman and managing director of Gummers, Limited, valve makers and brassfounders, of Rotherham, has been elected president of the Northern Employers Brassfounders' Association for the fourth successive year.

PROF. S. J. WATSON, MR. J. F. BOLTON, MR. G. W. WALKER, and DR. K. F. MACBEAN, have been elected chairman, vice-chairman, hon. secretary, and hon. recorder, respectively, to the Edinburgh section of the Society of Chemical Industry.

MR. F. J. CHARLTON, managing director of W. L. Byers & Company, Limited, anchor and cable manufacturers, of Sunderland, is visiting Scandinavia in search of orders. Last year the firm only supplied 900 anchors, as against 1,200 sold the previous year.

SIR GEOFFREY HEYWORTH, chairman of the Advisory Council of the Department of Scientific and Industrial Research since 1946, and Visiting Fellow of Nuffield College, Oxford, since 1947, is to receive the honorary degree of LL.D. from Manchester University.

PROF. SIR ALFRED EGERTON, F.R.S., who has been elected a Fellow of the Royal Society of Arts, was appointed Professor of Chemical Technology at the Imperial College of Science in 1936 and secretary of the Royal Society in 1938. He was Reader in Thermodynamics at Oxford University from 1921 to 1936 and was formerly a member of the Advisory Council of the Department of Scientific and Industrial Research.

MR. J. POWELL, who was formerly deputy chief engineer of the Margam and Port Talbot works of the Steel Company of Wales, Limited, has been appointed engineer in charge at the company's Abbey Works, where he has latterly been chief site engineer. Before joining the Steel Company of Wales in 1939, Mr. Powell had served with Brymbo Steel Company, Limited, Brymbo, near Wrexham, and John Summers & Sons, Limited, Shotton (Ches).

MR. GEORGE SENIOR, a director of General Refractories, Limited, Sheffield, has retired, owing to ill-health, after 31 years' service. Joining the company in 1919, he was associated with the late Mr. Frank Russell in its early development. He was appointed to the board in 1935. Mr. Senior recently received a gold wristlet watch from his colleagues throughout the organisation as a token of their friendship and esteem, the presentation being made by Sir Ronald W. Matthews, chairman of the company.

Obituary

SIR NORMAN HAWORTH

A distinguished chemist, Sir Walter Norman Haworth, F.R.S., president of the Chemical Society from 1944 to 1946, Vice-Principal of Birmingham University from 1947 to 1948, and vice-president of the Royal Society in 1948, died at Birmingham on March 18. He was 67 years of age.

After leaving Manchester and Göttingen universities, he became senior demonstrator in chemistry at the Imperial College, South Kensington, before taking up the post of reader in chemistry at St. Andrews University in 1912. Eight years later, Sir Norman moved to King's College, Newcastle, University of Durham, where he remained until 1925, when he was appointed to the Chair in Chemistry and Director of the Chemistry Department at Birmingham University. Sir Norman Haworth shared the Nobel Prize for Chemistry in 1937, and in 1942 he was awarded the Royal Medal of the Royal Society for his contributions to organic chemistry.

MR. J. D. BLOOMER, a director of Noah Bloomer & Sons, Limited, chain and anchor manufacturers, of Brierley Hill (Staffs), has died at the age of 79.

MR. WILLIAM ALFRED STEAD, founder and chairman of W. A. Stead & Company, Limited, textile-machinery manufacturers, of Holbeck Lane, Leeds, 11, has died at the age of 75.

MR. ALFRED EDWYN FOSTER BURDER, for many years a director and secretary of Messenger & Company, Limited, heating engineers and ironfounders, of Loughborough (Leics), has died at the age of 71.

MR. WILLIAM GIDDINS, who was for some 30 years manager with Stephenson, Blake & Company, Limited, typefounders, of Upper Allen Street, Sheffield, 3, has died at his home at Hemingford Grey (Hunts) at the age of 79.

Wills

REDMAN, ERNEST, a director of Lumbys, Limited, boilermakers, of Halifax	£5,743
MACKAY, ALEXANDER, formerly secretary of the Royal Technical College, Glasgow	£10,319
BENTLEY, GILBERT, of Wilmington (Kent), governing director of James Bentley, Limited, engineers, etc.	£43,692
ROBINSON, DAVID, late foundry manager at the Spring Hall Lane works of Hattersley (Ormskirk), Limited	£2,977
O'BEIRNE, ALEXANDER, managing director and joint founder of A. Cockburn & Company (Engineers), Limited, Glasgow	£34,548
WHITEHOUSE, THOMAS, a director of T. Whitehouse & Sons, Limited, hollow-ware manufacturers, of Lye, near Stourbridge	£6,329

JESSHOPE, LIMITED, have had plans approved to extend their foundry at West Street, Longport, Stoke-on-Trent.

PROFESSOR H. O'NEILL has been awarded a Nuffield Travelling Fellowship and is to visit Canada and the United States during July, August and September.

THE GRINDING, SCREENING AND FILTERING DIVISION of International Combustion, Limited, reports the following among orders recently received:—One 4 by 10 ft., two-surface, type 600 Ty-Rock shake-out screen to handle 60 tons of sand per hour plus 10 tons of castings destined for a foundry in this country.

British Standards Institution

New Standards Issued.—

The monthly information sheet issued by the British Standards Institution, of 24/28, Victoria Street, Westminster, London, S.W.1, for February, lists under "New Standards Issued":—

1610 Part 1: 1950. Verification of testing machines. Part 1. Methods of load verification; and verification of tensile and compression machines. (2s.).

Section A deals with methods of load verification by (*a*) standardised weights, (*b*) proving-levers, (*c*) elastic devices, (*d*) test-pieces, and (*e*) combination of linear measurement and load.

Section B deals with the verification of tensile, tensile and compression, and compression machines. It specifies the ranges over which the machine is to be verified, the procedure to be followed, the grading of the machine according to maximum permissible errors and the certification of the verification.

1617: 1950. Mild-steel castings of high magnetic permeability. (2s.).

This provides for two grades of steel castings possessing special magnetic properties for electrical applications. For each grade the chemical compositions and mechanical properties are specified. Recommended values for magnetic properties are included. The process of manufacture, fettling and dressing, freedom from defects, testing facilities, branding and repairs to castings are dealt with. Recommendations for welding are given in an appendix.

1629: 1950. Bibliographical references. (2s. 6d.).

A standard scheme for the preparation of references to literature is given, applying to entries for bibliographical lists and to particulars given for identification of works or parts of works referred to in reviews, abstracts, etc., but not necessarily applying to catalogues of particular collections.

1636: 1950. Terms used in spectrographic analysis. Part I. Emission spectrography. (2s.).

This standard defines terms commonly used in emission spectrography. The first section deals with photographic photometry, and defines such terms as transmission, exposure and contrast factor. The second section deals with light source, defining such terms as concentration calibration, analysis line, arc line and spark line.

Under the sub-heading "Aircraft," there are:—3 L.33: 1950. Aluminium-silicon alloy ingots and castings. (1s.). 2 L.35: 1950. "Y" aluminium-alloy ingots and castings (heat treated) (suitable for pistons). (1s.). L.51: 1950. Aluminium-alloy steels and castings (precipitation treated). (1s.). L.52: 1950. Aluminium-alloy ingots and castings (heat treated) (suitable for pistons). (1s.). L.53: 1950. Aluminium-magnesium alloy ingots and castings (solution treated). (1s.). L.101: 1950. Inspection and testing procedure for aluminium ingots, aluminium-alloy ingots and castings, magnesium ingots, magnesium-alloy ingots and castings. (2s.). L.121: 1950. Magnesium-8 per cent. aluminium alloy ingots and castings (as cast). (1s.). L.122: 1950. Magnesium-8 per cent. aluminium alloy ingots and castings (solution treated). (1s.). L.123: 1950. Magnesium-10 per cent. aluminium alloy ingots and castings (as cast). (1s.). L.124: 1950. Magnesium-10 per cent. aluminium alloy ingots and castings (solution treated). (1s.); and L.125: 1950. Magnesium-10 per cent. aluminium alloy ingots and castings (fully heat treated). (2s.).

Under "Future Publications," there is 1641: 1950: Cast-iron pipe fittings for sprinklers and other fire-protection installations; and under "Standard Withdrawn," STA 25: 1945. High-silicon iron castings, which is superseded by B.S. 1591: 1949: Acid-resisting high-silicon iron castings.

Under "New Work Started" there are malleable cast-iron and cast copper-alloy pipe fittings (screwed B.S.P. taper thread) for steam, water, gas and oil (revision B.S. 143); malleable cast-iron and cast copper-alloy pipe fittings for steam, water and gas. Screwed B.S.P. taper male thread and parallel female thread (revision B.S. 1256), and brazing brass ingots and castings (extension B.S. 1400).

Parliamentary

University Grants in Technology

Post-graduate courses in the main branches of engineering, metallurgy, mining, and chemical engineering, are being instituted or expanded by several universities, and to meet the costs of these courses, additional recurrent grants have so far been promised of the following amounts:—1949-50, £15,000; 1950-51, £42,000, and 1951-52, £57,000. SIR STAFFORD CRIPPS, giving this information in reply to a question by MR. HIGGS, mentioned that the courses, which are being arranged at the suggestion of the University Grants Committee, are intended mainly for graduates in technology who have already spent a few years in industry.

Restoration of Midland Iron-ore Field

Before deciding what further action was necessary in connection with the restoration of the Midland iron-ore field, the Minister of Town and Country Planning intended to visit the area to see the devastation for himself, said MR. LINDGREN, Parliamentary Secretary to the Ministry, in reply to MR. MITCHISON. A White Paper on the subject was on draft and the whole problem was being looked at, but the question arose about where the finance for repairing past devastation was to come from.

Movement of Wholesale Prices

The following table, taken from the "Board of Trade Journal," shows the movement of wholesale prices of industrial and building materials, expressed as percentage increases on the average for the year 1930 = 100.

Group.	1949.					1950.	
	Feb.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Coal ..	301.7	305.3	305.3	305.3	305.3	305.3	305.3
Iron and steel	237.7	257.6	257.9	258.1	257.8	257.7	257.7
Non-ferrous metals	268.8	239.9	277.5	283.3	277.2	277.4	276.8
Chemicals and oils	192.9	188.3	191.5	196.3	196.5	196.6	196.8
Building materials	224.4	225.0	226.8	225.9	225.2	227.3	227.3

Birmingham

Appropriately, just before the staging of the British Industries Fair, the City of Birmingham has in recent years, issued an illustrated handbook. The 1950 issue is particularly attractive. Good use has been made of illustration, and the inclusion of maps and lists of buildings, banks, and other establishments and amenities required by visitors to the city makes it what it sets out to be—a thoroughly comprehensive guide to the city. It costs sixpence and is obtainable from the Information Department, the Council House, Birmingham, 1.

Imports and Exports of Iron and Steel

Board of Trade Returns for February

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in February. Figures for the same month in 1949 are given for purposes of comparison, and totals for the first two months of this year are also included.

Total Imports of Iron and Steel

From	Month ended February 28.		Two months ended Feb. 28.
	1949.	1950.	1950.
	Tons.	Tons.	Tons.
Australia	2	1	9
Canada	6,086	2,847	6,258
Other Commonwealth countries and Irish Republic	112	3,490	14,432
Sweden	1,518	1,183	2,126
Norway	2,513	4,614	7,084
Germany	471	4,379	12,058
Netherlands	5,875	5,830	9,104
Belgium	26,470	5,837	10,479
Luxemburg	7,076	3,183	3,528
France	13,416	9,938	38,923
Austria	573	—	—
USA	9,104	6,737	11,472
Other foreign countries	191	246	1,387
TOTAL	73,407	48,285	116,860
Iron ore and concentrates—			
Manganiferous	—	—	—
Other sorts	492,526	685,878	1,361,557
Iron and steel scrap and waste, fit only for the recovery of metal	107,626	187,307	354,895

Exports of Iron and Steel by Products

Product.	Month ended February 28.		Two months ended Feb. 28.
	1949.	1950.	1950.
	Tons.	Tons.	Tons.
Pig-iron	294	1,799	4,065
Ferro-alloys, etc.—			
Ferro-tungsten	5	107	188
Spiegeleisen, ferro-manganese	519	198	564
All other descriptions	87	117	441
Ingots, blooms, billets, and slabs	60	164	422
Iron bars and rods	827	346	862
Sheet and tinplate bars, wire rods	118	140	442
Bright steel bars	1,699	2,690	6,848
Other steel bars and rods	10,645	20,632	45,765
Special steel	1,161	1,054	2,422
Angles, shapes, and sections	7,557	13,063	23,014
Castings and forgings	618	467	1,556
Girders, beams, joists, and pillars	1,530	5,006	8,513
Hoop and strip	3,855	6,820	11,556
Iron plate	306	209	637
Tinplates	16,992	18,669	36,661
Tinned sheets	309	167	372
Terneplates and decorated tinplates	97	33	60
Other steel plate (⅛ in. thick and over)	17,528	19,719	42,700
Galvanised sheets	6,307	7,058	18,401
Black sheets	10,717	8,624	19,648
Other coated plates	219	1,012	1,952
Cast-iron pipes, up to 6-in. dia.	6,814	4,650	12,066
Do., over 6-in. dia.	8,454	5,798	13,311
Wrought-iron tubes	22,432	26,778	56,440
Railway material	15,514	25,607	42,556
Wire	3,790	4,764	10,377
Cable and rope	2,003	2,374	5,566
Netting, fencing, and mesh	2,012	1,513	4,202
Other wire manufactures	1,108	1,530	3,397
Nails, tacks, etc.	685	390	781
Rivets and washers	929	594	1,315
Wood screws	258	222	560
Bolts, nuts, and metal screws	1,752	2,218	5,116
Stoves, grates, etc. (excl. gas)	770	987	1,932
Do., gas	230	188	369
Baths	757	1,179	2,418
Anchors, etc.	718	986	1,597
Chains, etc.	692	732	1,605
Springs	483	596	1,460
Hollow-ware	7,212	9,549	17,128
All other manufactures	20,064	18,843	41,327
TOTAL	178,127	217,592	449,883

Total Exports of Iron and Steel

Destination.	Month ended February 28.		Two months ended Feb. 28.
	1949.	1950.	1950.
	Tons.	Tons.	Tons.
Channel Islands	1,007	761	1,537
Gibraltar	310	136	285
Malta and Gozo	739	490	986
Cyprus	410	1,172	1,361
British West Africa	7,354	9,250	18,636
Union of South Africa	9,160	10,916	20,300
Northern Rhodesia	1,547	1,952	4,111
Southern Rhodesia	4,800	6,433	12,355
British East Africa	5,833	7,453	15,502
Mauritius	164	622	1726
Bahrein, Koweit, Qatar and Trucial Oman	1,546	718	1,224
India	4,688	6,230	13,050
Pakistan	2,482	5,006	8,420
Malaya	4,210	4,555	13,773
Ceylon	1,729	3,072	5,886
North Borneo	1,513	1,043	1,916
Sarawak	719	338	495
Hong kong	3,060	4,184	8,327
Australia	9,388	32,231	55,845
New Zealand	6,985	13,365	30,888
Canada	1,700	3,550	11,225
British West Indies	3,603	7,535	12,372
British Guiana	346	469	1,064
Anglo-Egyptian Sudan	969	1,131	2,753
Other Commonwealth countries	1,945	968	1,907
Irish Republic	5,719	6,293	12,075
Russia	3,006	152	205
Finland	4,546	4,646	10,835
Sweden	4,321	6,339	13,257
Norway	5,709	4,227	10,547
Iceland	222	167	1,137
Denmark	8,816	11,123	24,408
Poland	301	180	243
Germany	48	42	100
Netherlands	10,969	5,835	11,080
Belgium	1,019	1,486	2,527
Luxemburg	507	—	253
France	3,632	1,462	2,534
Switzerland	1,571	2,039	2,675
Portugal	1,734	1,534	2,616
Spain	1,892	887	1,616
Italy	241	666	1,375
Hungary	15	55	136
Greece	793	481	1,059
Turkey	2,409	1,621	2,492
Indonesia*	2,314	519	3,197
Netherlands Antilles	980	886	2,487
Belgian Congo	223	147	250
Angola	105	270	756
Portuguese East Africa	281	389	819
Canary Islands	244	241	397
Syria	120	55	73
Lebanon	4,131	669	1,582
Israel	1,754	1,383	3,239
Egypt	3,658	5,654	11,026
Morocco	16	172	198
Saudi Arabia	230	186	388
Iraq	1,308	2,820	6,100
Iran	9,883	12,432	24,027
Burma	857	1,055	1,744
Thailand (Siam)	421	1,097	1,774
China	657	151	421
Philippine Islands	492	667	2,338
USA	230	1,002	1,453
Cuba	26	73	258
Colombia	425	186	608
Venezuela	4,791	3,397	8,221
Ecuador	567	149	513
Peru	1,277	293	1,213
Chile	181	316	2,421
Brazil	1,656	1,598	5,455
Uruguay	1,288	681	1,646
Argentine	5,990	6,396	13,996
Other foreign countries	945	1,893	6,169
TOTAL	178,127	217,592	449,883

* Includes Netherlands New Guinea in 1949.

STANTON-DALE

REFINED PIG IRON

Designed to meet the demands of high quality castings, which are, strength, machineability and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

The above illustration shows a group of castings made by Messrs. Goodbrand & Co. Ltd., Stalybridge, Cheshire.

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Pig-iron and Steel Production in Great Britain

Summary of January Statistics

The following particulars of pig-iron and steel production in Great Britain have been extracted from the Statistical Bulletin for February, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in January, with the number of furnaces in blast; Table II, production of steel ingots and castings in January, and Table III, deliveries of finished steel. Table IV summarises activities during the six months ended January.

TABLE I.—*Weekly Average Production of Pig-iron and Ferro-alloys during January.* (*Thousands of Tons.*)

District.	Furnaces in blast 28.1.50	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants, and Essex	26	—	16.9	24.5	1.7	—	43.1
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire / Yorkshire (incl. Sheffield, excl. N.E. Coast)	6	—	7.0	—	—	1.5	8.5
Lincolnshire	14	—	24.7	—	—	—	24.7
North-East Coast	23	7.8	36.9	0.4	—	1.4	46.5
Scotland	7	0.8	9.6	2.6	—	—	13.0
Staffs., Shrops., Worcs., and Warwick	9	—	9.5	1.6	—	—	11.1
S. Wales and Monmouthshire	8	4.3	19.9	—	—	—	24.2
North-West Coast	7	16.1	—	0.2	—	—	16.3
Total	100	29.0	124.5	29.3	1.7	2.9	187.4
December, 1949	102	27.9	122.6	30.1	1.8	3.3	185.7
January, 1949	103	26.0	116.9	29.6	2.0	3.5	178.1†

† Incl. 100 tons of direct castings.

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1948.	1949.	1949. Jan.	1949. Dec.r	1950. Jan.
Non-alloy Steel :—					
Heavy rails and sleepers	8.9	9.8	9.9	10.5	9.8
Heavy and medium plates	36.1	39.2	35.7	40.5	39.0
Other heavy prod.	34.7	36.1	33.6	35.4	35.1
Light rolled products§	59.7	46.4	45.6	43.6	46.7
Hot-rolled strip		17.1	16.3	18.2	17.5
Cold-rolled strip	4.8	4.9	5.1	4.6	5.2
Bright steel bars	6.1	5.8	6.6	5.6	5.8
Sheets, coated and uncoated	26.3	27.6	29.3	28.1	31.0
Tin, terne and black-plate	13.5	13.7	14.6	12.9	15.1
Tubes, pipes and fittings	15.1	18.5	17.0	19.4	19.3
Wire	12.8	15.0	14.5	14.7	15.3
Tyres, wheels and axles	3.9	4.1	4.0	3.5	3.6
Forgings	6.0	6.3	6.3	6.1	6.4
Castings	3.5	3.6	3.4	3.6	3.5
Total	231.4	248.1	241.9	246.7	253.3
Alloy Steel† :—					
Tubes and pipes	0.4	0.6	0.5	0.8	0.7
Bars, sheets, strip and wire	4.7	4.7	5.2	4.4	4.4
Forgings	2.5	2.7	3.0	2.7	3.0
Castings	0.7	0.7	0.7	0.7	0.8
Total	8.3	8.7	9.4	8.6	8.9
Total deliveries from U.K. prod.‡	239.7	256.8	251.3	255.3	262.2
Add from other U.K. sources	5.7	5.5	5.1	6.3	6.0
Imported finished steel	3.4	7.7	5.6	4.8	4.1
	248.8	270.0	262.0	266.4	272.3
Less intra-industry conversion	35.0	39.1	37.6	35.0	37.9
Total deliveries of finished steel	213.8	230.9	224.4	231.4	234.4

† Excludes high-speed steel. ‡ Includes finished steel produced in the U.K. from imported ingots and semi-finished steel. r Revised.
§ Excl. wire rods and alloy-steel bars, but incl. ferro-concrete bars.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in January.* (*Thousands of Tons.*)

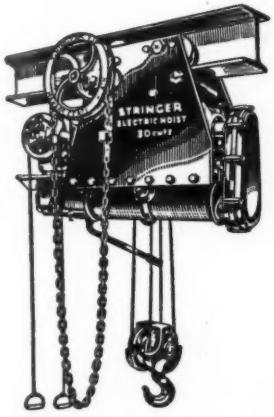
District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex	—	0.8	11.6(Basic)	1.2	0.2	13.2	0.6	13.8
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire / Yorkshire (excl. N.E. Coast and Sheffield)	1.5	22.7	—	1.2	0.4	24.8	1.0	25.8
Lincolnshire	—	31.4	—	—	0.1	31.4	0.1	31.5
North-East Coast	1.7	61.0	—	0.8	0.4	62.3	1.6	63.9
Scotland	2.7	31.3	—	1.1	0.6	34.3	1.4	35.7
Staffs., Shrops., Worcs. and Warwick	—	14.8	—	0.7	0.7	14.9	1.3	16.2
S. Wales and Monmouthshire	9.8	49.2	6.1 (basic)	0.9	0.1	65.7	0.4	66.1
Sheffield (incl. small quantity in Manchester)	8.8	27.2	—	7.4	0.7	42.2	1.9	44.1
North-West Coast	0.7	2.4	5.0 (acid)	—	0.1	8.1	0.1	8.2
Total	25.2	240.8	22.7	13.3	3.3	296.9	8.4	305.3
December, 1949	23.6	230.8	21.5	12.3	3.2	283.4	8.0	291.4
January, 1949	27.8	223.0	19.6	14.7	3.4	280.5	8.0	288.5

TABLE IV.—*General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy). Imports.†	Output of ingots and castings.	Deliveries of finished steel.	Stocks.‡
1938	228	89	—	130	118	16	200	—	—
1948	252	172	200	178	174	8	286	214	1,028
1949	258	169	199	183	188	17	299	231	1,275
1949—August*	248	172	196	182	179	21	288	205	1,320
September	266	177	199	185	194	19	306	239	1,331
October	237	178	196	184	194	12	307	242	1,296
November*	249	180	199	187	200	8	315	245	1,246
December	249	170	197	186	181	12	291	231§	1,275
1950—January	260	175	198	187	189	11	305	234	1,263

* Five weeks. † Weekly average of calendar month. ‡ Stocks at end of years and months shown. § Revised.

ELECTRIC HOISTS



- PULLEY BLOCKS
- CUPOLA LIFTS
- RUNWAYS
- ELECTRIC CRANES
- SLING CHAINS

STRINGER & SON (CRADLEY HEATH) **LTD**
Engineers **CRADLEY HEATH, Staffs.**

★ *2,000 MOULDERS CAN'T BE WRONG!*

Partex

PARTING and FACING POWDER
(NON-SILICA : NON-HYGROSCOPIC)

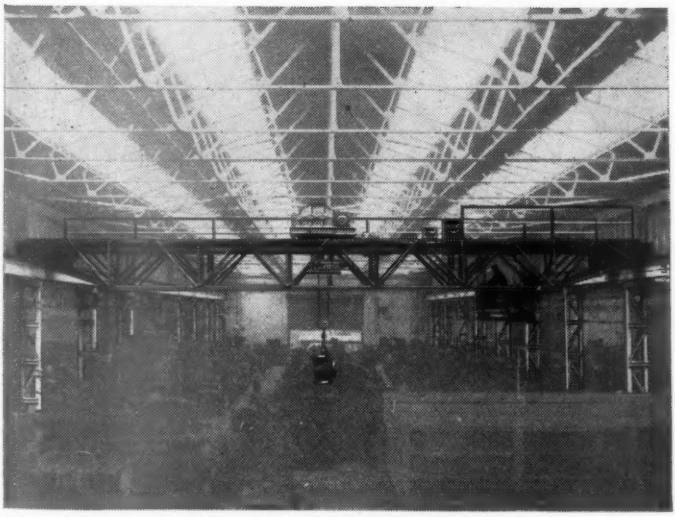
AN ECONOMICAL AND EFFECTIVE SUBSTITUTE FOR ORIGINAL RUSSIAN LYCOPODIUM
BRINGS OUT THE MOST INTRICATE DETAIL
NON REACTIVE WITH MOLTEN METALS

★ *A very conservative estimate as well over 500 Foundries are using Partex*

FOUNDRY & METALLURGICAL F&MSL

F. & M. SUPPLIES LTD.
4, BROAD STREET PLACE, LONDON, E.C.2 PHONE LONDON WALL 2031-2
Sales Agents for London and Southern Counties
W. J. HOOKER LTD., 4, Midland Crescent, N.W.3
Scottish Representatives & Stockists
A. JEFFREY & CO. LTD., 75, Buchanan St., Glasgow C.1

ANDERSON CRANES FOR FOUNDRIES



5-ton Electric Overhead Crane 56' 3" span.

- ENCLOSED GEARS
- CLOSE SPEED CONTROL
- RELIABILITY
- ROBUST CONSTRUCTION
- INTERCHANGEABLE SPARES
- LOW RUNNING COSTS

LONDON OFFICE:
Finsbury Pavement House,
12 Moorgate, E.C.2.
Tel: MONarch 4629

'Phone Carnoustie 2214/5

THE ANDERSON-GRICE Co LTD
TAYMOUTH ENGINEERING WORKS - CARNOUSTIE - SCOTLAND

'Grams "Diamond" Carnoustie

Raw Material Markets

Iron and Steel

The engineering foundries continue to be the busiest section of the castings industry, with order-books which enable them to maintain full production. Demand is likely to be maintained. There are many calls for castings from trades which have increased export commitments, among them the motor, tractor, and agricultural-implement manufacturers. These foundries are taking up all the low- and medium-phosphorus iron they can procure, and, owing to an inadequate supply of these grades, are indenting for increased quantities of hematite pig-iron and the refined grades. Producers of low- and medium-phosphorus irons could dispose of much larger tonnages. The makers of hematite are generally able to satisfy current demands, and are also providing the higher silicon contents which are preferred by many foundries. The refined grades relieve the shortage of other irons.

Other foundries continue to be steadily employed, but would welcome more business, as the current volume of orders is not heavy and goes into immediate production, permitting little or no improvement in the forward position. The jobbing establishments and many of the light foundries are not heavily employed, with the result that some grades of iron could be in better demand. The light foundries' requirements of high-phosphorus iron are easily satisfied in the Northamptonshire grade; Derbyshire iron is in heavier demand from foundries producing castings for the engineering and textile trades.

There is a strong demand for cupola scrap, although foundries, generally, have sufficient supplies at hand for their immediate needs.

Foundry coke deliveries are maintained and there are only scattered complaints concerning supply and quality. Ganister, limestone, firebricks, and ferro-alloys are obtained without much trouble.

Buyers abroad would gladly take up any available tonnages of foundry iron and hematite, but apart from parcels of refined iron no shipments are permitted.

The heavy mills of the re-rollers continue to experience a dearth of orders for their products, as home consumers have good stocks, and export business is not sufficiently heavy to absorb the balance of their potential production. This situation obtains also in the heavier sizes rolled by the light mills, but for the smallest sections are bars rolled by them there is a ready market. Galvanised and black sheets are in great demand, and outputs are fully covered. Judging by the volume of fresh business which is available, the sheet mills will be heavily engaged for a long time ahead, as users, both at home and abroad, have demands which cannot be fulfilled for many months. The strip mills also have good order-books, chiefly for the narrower gauges.

Non-ferrous Metals

Larger supplies of lead being now available, the Ministry of Supply has decided to suspend the allocation system as from the end of this month. This means that, as from April 1, lead consumers will be able to obtain metal for consumption without any limit upon the amount in a given period. Licences will still be required for the purchase of lead, and users should still continue to use as much scrap lead as possible, in order to conserve imported metal.

The Ministry announces also that the present restrictions governing the supply of lead used in making sheet and pipe, compound, etc., for export are now relaxed. An export licence will still, however, be necessary, and exporters should obtain a licence before confirming an order. Fabricators who can obtain export orders will be free to buy metal. Virgin lead can in future be ordered from the Directorate of Non-ferrous Metals for forward delivery in the same way as zinc—that is, for delivery in the current and following months at the price announced in the Press; in the second and third month after the current month at a premium of £2 per ton, and in the fourth, fifth, and sixth months after the current month at a premium of £4 per ton. Manufacturers will not be able to book a quantity of virgin metal for delivery in any one month greater than is required to meet orders from customers, or can be consumed in a month.

Consequent upon a rise in the United States market, the domestic price of zinc in the United Kingdom was raised as from Tuesday last by £2 to £89 10s. a ton.

Although the tin market closed below the best point reached last week, there was, nevertheless, a net gain of about £4 in cash and £6 10s. in three months. Yesterday (Wednesday) the market was very weak. During last week the contango was maintained and at one time widened to about 25s., which must be regarded as something of an achievement. It is true that the large stocks of prompt tin available ought to operate to depress the cash quotation and establish a premium of perhaps £3 or £4 for the forward price. But the point is that consumers do not believe in tin at £600, and, therefore, the idea of paying a premium over this in order to secure metal for forward delivery does not at all appeal to them. The London market now has a certain amount of "free" metal which is of no little assistance. It is not a large tonnage, for the bulk of the tin in the Far East is being shipped to the United States, but it makes all the difference. The Eastern quotation is firm and has been instrumental in raising the price in Whittington Avenue. But, nevertheless, the position in tin remains precarious. It is all very well for the authorities to peg the price at £600 so far as their sales are concerned, but the fact remains that the metal is in over supply and month by month the surplus of production over consumption is increased. The US stockpile continues to grow, and although this reserve is not by any means completed, the tonnage already accumulated is very large. The problem of dealing with this situation has been receiving careful consideration by the Study Group at its Paris meeting, and it is believed that an elaborate scheme involving both producers and consumers has been under consideration.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £604 15s. to £605; Friday, £602 5s. to £602 15s.; Monday, £600 10s. to £601; Tuesday, £596 to £597; Wednesday, £589 10s. to £590.

Three Months—Thursday, £605 to £605 5s.; Friday, £604 to £604 5s.; Monday, £603 5s. to £603 15s.; Tuesday, £599 10s. to £600 10s.; Wednesday, £592 to £598.

Production of blister copper outside the United States during February totalled about 111,000 short tons, while the output of refined copper came to 83,500 tons. Deliveries of refined copper amounted to 69,000 tons, which was about 10,000 short tons less than the January figure. United Kingdom usage of copper keeps up very well considering the high price at which the metal now stands, and the indications for the present year are that trade in non-ferrous metals will be brisk. That, at least, is the impression conveyed by events during the first quarter and there does not seem to be any reason to anticipate a setback.